

Fishery Data Series No. 16-30

Upper Cook Inlet Sockeye Salmon Escapement Studies, 2014

by

William J. Glick

and

T. Mark Willette

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Alaska Department of Fish and Game

Divisions of Sport Fish and Commercial Fisheries



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Weights and measures (metric)		General		Mathematics, statistics	
centimeter	cm	Alaska Administrative	AAC	<i>all standard mathematical signs, symbols and abbreviations</i>	
deciliter	dL	Code		alternate hypothesis	H _A
gram	g	all commonly accepted	e.g., Mr., Mrs., AM, PM, etc.	base of natural logarithm	e
hectare	ha	abbreviations		catch per unit effort	CPUE
kilogram	kg			coefficient of variation	CV
kilometer	km	all commonly accepted	e.g., Dr., Ph.D., R.N., etc.	common test statistics	(F, t, χ^2 , etc.)
liter	L	professional titles		confidence interval	CI
meter	m		@	correlation coefficient	R
milliliter	mL	at		(multiple)	
millimeter	mm	compass directions:		correlation coefficient	
		east	E	(simple)	r
		north	N	covariance	cov
		south	S	degree (angular)	°
		west	W	degrees of freedom	df
		copyright	©	expected value	E
		corporate suffixes:		greater than	>
		Company	Co.	greater than or equal to	≥
		Corporation	Corp.	harvest per unit effort	HPUE
		Incorporated	Inc.	less than	<
		Limited	Ltd.	less than or equal to	≤
		District of Columbia	D.C.	logarithm (natural)	ln
		et alii (and others)	et al.	logarithm (base 10)	log
		et cetera (and so forth)	etc.	logarithm (specify base)	log ₂ , etc.
		exempli gratia		minute (angular)	'
		(for example)	e.g.	not significant	NS
		Federal Information		null hypothesis	H ₀
		Code	FIC	percent	%
		id est (that is)	i.e.	probability	P
		latitude or longitude	lat or long	probability of a type I error	
		monetary symbols		(rejection of the null hypothesis when true)	α
		(U.S.)	\$, ¢	probability of a type II error	
		months (tables and		(acceptance of the null hypothesis when false)	β
		figures): first three		second (angular)	"
		letters	Jan,...,Dec	standard deviation	SD
				standard error	SE
		registered trademark	®	variance	
	AC	trademark	™	population	Var
	A	United States		sample	var
	cal	(adjective)	U.S.		
	DC	United States of	USA		
	Hz	America (noun)	United States		
	hp	U.S.C.	Code		
	pH	U.S. state	use two-letter		
			abbreviations		
			(e.g., AK, WA)		
volts	V				
watts	W				

FISHERY DATA SERIES NO. 16-30

**UPPER COOK INLET SOCKEYE SALMON ESCAPEMENT STUDIES,
2014**

by

William J. Glick

Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna
and

T. Mark Willette

Alaska Department of Fish and Game, Division of Commercial Fisheries, Soldotna

Alaska Department of Fish and Game
Division of Sport Fish, Research and Technical Services
333 Raspberry Road, Anchorage, Alaska, 99518-1565

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*William J. Glick and T. Mark Willette,
Alaska Department of Fish and Game, Division of Commercial Fisheries,
Soldotna, Alaska USA*

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ABSTRACT

In 2014, the Alaska Department of Fish and Game used dual-frequency identification sonar to estimate an escapement of 1,520,340 (95% CI: 1,494,105–1,546,575) sockeye salmon (*Oncorhynchus nerka*) into the Kenai River, 440,192 (95% CI: 438,380–442,003) into the Kasilof River, and 55,759–137,256 into the Yentna River. Escapement estimates for the Kenai River were adjusted postseason relating to an overlap of sockeye and pink salmon (*O. gorbuscha*). An escapement range for the Yentna River was estimated postseason for sockeye, pink, chum (*O. keta*), and coho (*O. kisutch*) salmon from 6 sets of fish wheel selectivity indices obtained from the literature. The predominant age classes for sockeye salmon in the Kenai River were 1.2 (12.3%), 1.3 (63.5%), 2.2 (7.2%), and 2.3 (15.3%); Kasilof River 1.2 (42.4%), 1.3 (29.4%), and 2.2 (20.6%); Yentna River 1.2 (39.4%), 1.3 (33.3%), 2.2 (12.4%) and 2.3 (10.2%). Length and sex ratio information were also collected for sockeye salmon at each river. Results of escapement projects conducted by other agencies and organizations are also briefly mentioned in this report.

Key words: sockeye salmon, *Oncorhynchus nerka*, sonar, DIDSON, fish wheel, side-looking sonar, gillnet, apportionment, fish wheel coefficient, test fishery, escapement, fish passage, salmon migration, age, sex, length (ASL), Upper Cook Inlet, Susitna River, Kenai River, Kasilof River, Yentna River.

INTRODUCTION

In Upper Cook Inlet (UCI) Alaska, sonar technology has been used to estimate hourly and daily salmon (*Oncorhynchus* spp.) run sizes in the Kenai and Kasilof rivers since the late 1970s and in the Yentna River, a tributary of the Susitna River, since the mid-1980s (Figure 1; Waltemeyer et al. 1980; King and Tarbox 1988). The species composition of each escapement has been estimated from daily fish wheel catches in each river. In this report, escapement refers to estimates of the number of salmon, by species, migrating upstream to spawn past a fixed point on the river. When any number of salmon are harvested upstream of the enumeration point, the number of fish that survive to spawn will be less than the escapement referred to in this report.

Optimal escapement goals (OEG), which consider both biological and allocative issues, were revised in 2011 by the Alaska Board of Fisheries for late-run sockeye salmon (*Oncorhynchus nerka*) in the Kenai and Kasilof rivers (Shields and Dupuis 2012). In 2014, the OEG for sockeye salmon into the Kenai River was 700,000–1,400,000. More specifically, the Alaska Department of Fish and Game (ADF&G) manages for a Kenai River inriver escapement goal dependent upon forecasts and daily inseason evaluations of run strength. If the sockeye salmon run forecast is <2,300,000, the inriver escapement goal is 900,000–1,100,000; for a run of 2,300,000–4,600,000, the goal is 1,000,000–1,200,000; and for a run >4,600,000, the goal is 1,100,000–1,350,000 fish. The OEG for sockeye salmon into the Kasilof River is 160,000–390,000. In 2009, the sustainable escapement goal (SEG) for Yentna River sockeye salmon was eliminated because of uncertainties in the Yentna sonar/fish wheel escapement estimates and use of escapement data for inseason management was curtailed. Instead of using sonar generated escapement estimates from the Yentna River sonar study site to estimate Susitna River drainage sockeye salmon escapement, an SEG for Susitna River sockeye salmon were established for weirs at Judd (25,000–55,000), Chelatna (20,000–65,000), and Larson (15,000–50,000) lakes (Figure 2; Fair et al. 2009, 2013).

SONAR DEVELOPMENT IN UPPER COOK INLET

Prior to 1968, sockeye salmon escapement estimates in UCI were based on surveys of clear water spawning areas and provided no information about the distribution or number of sockeye salmon in glacially occluded waters (King et al. 1989). Commercial and recreational fishery management efforts were further hampered by lack of daily and cumulative estimates of

escapement. The development of side-looking (once referred to as side-scan) sonar techniques by Bendix Corporation¹ made it possible to estimate sockeye salmon in certain glacial tributaries of UCI.

The use of sonar to estimate the inriver salmon migration began on the Kenai and Kasilof rivers in 1968 with the use of multiple transducer systems (MTS), transducers arrayed linearly in up-looking positions (Namvedt et al. 1977; Davis 1971). Side-looking sonar aimed horizontally atop an artificial substrate was tested on the Kenai River north bank between 12 July and 3 August 1977 using a 1977 model transducer (escapement counts in 1977 were derived from an MTS array). Side-looking sonar proved to be more practical and was implemented on both banks of the Kenai River in 1978. A similar unit was deployed for the first time on the north bank of the Kasilof river in 1977 (south bank counts also used an MTS array), and by 1979 both banks of the Kasilof River were utilizing side-looking sonar. In the Susitna River, an attempt to utilize MTS equipment failed in 1976, leading to use of side-looking sonar, which began with limited success in 1978.

Initially, all side-looking transducer systems were mounted on 20 cm (8 in) by 18.3 m (60 ft) diameter aluminum tubing (artificial substrate) and positioned on the bottom of the river, perpendicular to the bank. This arrangement forced fish to move across the artificial substrate and through the sonar beam. A transition to substrateless counters began in the late 1980s to eliminate the effects that artificial substrates had on fish behavior and the constant maintenance and safety problems with tree and brush entanglements. Substrateless counters began operation in the Kenai River in 1987 (north bank) and 1993 (south bank); Yentna River in 1994 (south bank) and 1995 (north bank); and in the Kasilof River in 2003 (both banks).

Prior to the early 1980s, sonar operations were conducted at different sites on the Kasilof and Yentna rivers. In 1983, the Kasilof River site was relocated from the outlet area of Tustumena Lake (about 3 km below the lake) to river kilometer 12.1 (mile 7.5), near the Sterling Highway Bridge and closer to Cook Inlet (King and Tarbox 1984; Figure 1). The Susitna River site, near the confluence with Yentna, was abandoned in 1985 when recurrent flooding rendered the site untenable. The site was relocated to the Yentna River in 1986, about 9.2 km (6 mi) upstream of the confluence with the Susitna River and about 53 (river) km from Cook Inlet (King and Tarbox 1988). The Kenai River sonar site has been located at river kilometer 30.9 (mile 19.2) since the 1960s.

Dual frequency identification sonar (DIDSON; Belcher et al. 2001, 2002) was used for the first time to estimate escapement on the south bank of the Kenai River in 2007 and on the north bank in 2008; for the first time on both banks of the Kasilof River in 2010; and for the first time in the Yentna River (both banks) in 2009 (Westerman and Willette 2010a-b).

FISH WHEELS AND APPORTIONMENT

Fish wheels are used at each sonar site to collect representative samples of each run for the purpose of apportioning sonar counts by species (when necessary) and to collect morphological information such as age, sex, and length (ASL) data from sockeye salmon. Fish wheels were once deployed along both banks of the Kenai and Kasilof rivers but beginning in the mid-1980s were reduced to one fish wheel on the north bank of each river because species composition was

¹ Product names used in this report are included for scientific completeness, but do not constitute a product endorsement.

similar between banks. The Yentna River has always required 2 fish wheels, one on each bank, because of differences in species composition. Factors influencing the accuracy of escapement estimates for pink (*O. gorbuscha*), coho (*O. kisutch*), chum (*O. keta*), and Chinook (*O. tshawytscha*) salmon in the Yentna River were discussed by Tarbox et al. (1981, 1983).

Prior to 1999, a minimum fish wheel catch of 150 fish was required to apportion sonar counts in the Kenai River. However, during periods of low passage rates, it would take several days to attain an adequate sample size. In 1999 the apportionment guideline changed so that apportionment would not begin until salmon species other than sockeye exceeded 5% of the total fish wheel catch and the catch of other salmon was in an upward trend. The same criteria were also applied to the Kasilof River. Altering the method by which sonar counts were apportioned to species did not significantly change the final sockeye salmon estimates ($p < 0.05$) and was more defensible. Salmon species have always been apportioned from Yentna River sonar counts by bank because of the variability of run timing and differences in species composition between banks.

OBJECTIVES

The 3 main objectives for UCI salmon escapement projects in 2014 were to estimate the following:

1. The daily and cumulative escapement and run timing of sockeye salmon into the Kenai and Kasilof rivers such that the season total estimate is within 10% of the true value 95% of the time.
2. A minimum and maximum escapement range for the Yentna River.
3. Age, length, and sex compositions for sockeye salmon escapements in each river such that the estimates are within 5% of the true value 90% of the time.

Secondary objectives included the following:

1. Conduct a feasibility study on the Yentna River to test drift gill netting as a potential sampling method to replace the use of fish wheels.
2. Determine counting differences among individual observers for DIDSON subsample image files during the season.
3. Conduct stream surveys to estimate salmon escapement in Quartz and Ptarmigan Creeks in the upper Kenai River watershed.

METHODS

SONAR SITES

The Kenai River is a glacial river approximately 120 m wide (at the sonar site) when the water level peaks in early August. River bottom profiles have remained relatively the same since the 1960s when sonar was first tested in the river (Figure 3). Historically, bottom profiles have been determined by the use of measuring rods and depth finders, but in recent years DIDSON has been used to construct river bottom profiles. The Kenai River north bank transducer was located on the inside of a gentle curve in the river that slopes gradually (~1 m drop in 30 m) toward the opposite bank causing fish to be more dispersed during low water. The south bank slope is steeper (dropping ~1.5 m within the first 10 m, 2.2 m/25 m) and deeper with swifter current than the north bank, forcing most fish to stay within 2–10 m of shore throughout the run. The river

bottom consists mostly of rocks 10–30 cm in diameter along both banks with a few bigger rocks (~50 cm) scattered along the south bank.

The Kasilof River is a glacial river about 60 m wide at the sonar site when discharge peaks in early August. The north bank transducer site slopes downward 0.6 m within the first 3 m from shore then flattens to a slope of ~0.25 m in 30 m. The south bank slope is relatively constant, dropping slightly more than 1 m in 40 m. The river bottom consists mostly of rocks 20–60 mm in diameter along both banks, although larger rocks and boulders exceeding 1 m³ are common along the north bank.

The Yentna River is very turbid, 3–5 cm (Secchi disc depth) at the surface, between 250 m and 300 m wide at the sonar site and rising and falling up to 0.2 m daily. The river profile at each transducer site was relatively steep, dropping 4 m (depth) within 20 m distance on the north bank and over 3 m in the first 10 m on the south before flattening in the next 10 m of range. The substrate consists of rounded rocks on the north bank and angular or blocky rocks on the south, averaging 10–30 cm in diameter along both banks.

DIDSON OPERATIONS

For all 3 rivers, the DIDSON alternated between 1 of 2 frequencies, 1 of 1.8 MHz with an acoustic beam consisting of 96 beams (0.3° x 14°) and a range limit of 10 m, and the other of 1.1 MHz with an acoustic beam consisting of 48 beams (0.4° x 14°) and a range limit of 30 m. The range limit was extended on the north bank of the Kenai River by installing a unique lens on the DIDSON unit. The river channels, bank to bank, were not completely ensonified with these range limits, but encompassed the expected traveling path of sockeye salmon for each river. The nearshore files, set at high frequency, usually recorded at 8 frames per second and the offshore files (low frequency) recorded at 6 frames per second. The pulse length of the DIDSON makes it difficult to field-test target strengths (TS); however, a 38.1 mm calibration sphere was clearly seen in DIDSON images from early field tests (Maxwell and Gove 2007). The TS of the sphere is theoretically between -38 dB and -39 dB for each frequency at a water temperature of 9°C.

DIDSON transducers were mounted on aluminum H-shaped stands for each river in approximately 0.6 m of water and ~15 cm above the bottom in a horizontal side-looking position on both river banks. For DIDSON units that did not come with an internal attitude sensor, an Applied Geomechanics Inc. digital analog clinometer was mounted externally to the DIDSON transducer, which was mounted to a HTI brand rotator operated by a control box located in a shed. The DIDSON transducer was placed 1–1.5 m from the offshore end and immediately upstream of a short weir, which extended approximately 3–6 m into the river.

An automated rotator coupled with an attitude sensor assured proper aim once the transducer was deployed. The aiming protocol of Maxwell and Smith (2007) was used as a guideline to determine the best aim for each river. The DIDSON position, the nominal beam angle, and the range were used to calculate and graph the sonar beam over each river profile (Figure 4). The height of the transducer was adjusted above the river bottom to determine “best fit” or beam angle for the desired range of the beam. At the start, the angle of the rotator/transducer was set and adjusted by an attitude sensor and seldom adjusted unless the transducer moved. The same beam angles were used in 2014 as in previous years because the DIDSON transducer was placed in the same location, at the same height and aimed the same direction horizontally. To verify the aim, an artificial target or float was moved along the river bottom ~2 m in front of the transducer and through the acoustic beam. Once a proper aim was established, pitch and roll data from the

attitude sensor was collected to maintain that aim, particularly when the DIDSON had to be moved or cleaned. Silt buildup behind the DIDSON lens was a problem, so lenses were cleaned once a week on the Kenai and Kasilof rivers and daily on the Yentna River to maintain signal strength integrity and visual acuity.

Unlike echogram based technologies which produce still frame pictures of fish targets on a paper print out or computer screen, DIDSON produces black and white sonogram-like video images of swimming fish. In these videos, fish are seen as moving or, “swimming” across a predominantly static background or river substrate. To date, trial auto counting methods for enumerating moving fish images have not been very accurate; therefore, the video-like DIDSON images of individual fish were manually counted with a tally whacker from a computer screen (Faulkner and Maxwell 2015). DIDSON units operated on both river banks of each river 24 hours per day and once each hour, DIDSON programing recorded 2 image files of fish passage for 10 min within ranges of 1–10 m and 10–20 or 10–30 m from shore depending fish distribution. Laptop computers collected data in a DIDSON video file and backed it up on 1 TB external hard drives. Technicians played back each image file containing a video recording, and counted all migrating fish observed with 2 tally whackers, 1 for fish swimming upstream and 1 for fish swimming downstream. Counts were entered into an MS Excel spreadsheet that automatically calculated hourly and daily totals. Resident fish species or holding salmon were ignored because only migrating salmon were enumerated for escapement purposes. Fish images that were substantially larger than average salmonid images and were outside the immediate migration pattern were deemed as Chinook salmon and were not included in the daily count. In general, Chinook salmon are observed from mid-July to the end of the season at a rate of 1–10 fish per day.

To process and count the raw images as quickly and accurately as possible, a DIDSON background subtraction algorithm was often used to view the images of fish against a black background. For counting purposes, an intensity setting of 40 dB and threshold of 4–5 dB produced the best contrast that ensured counting ease and accuracy. Playback frame rates often varied between 8 and 30 frames dependent on fish densities and the ability of individual observers to accurately differentiate fish images. Intensity and threshold levels used by technicians were relatively constant with small variations between individuals for personal preference. Hourly fish counts from image files were continuously compiled and frequently relayed to management biologists for timely inseason commercial fishery applications. In addition to these escapement estimates, management biologists use inseason commercial fishery data to prosecute the fishery.

ESTIMATING FISH PASSAGE

For each bank separately, all fish images on a computer screen were counted with a tally whacker for each nearshore (n) and offshore (o) 10 min file, differentiating upstream (n_u) from downstream (n_d) swimming fish. Counts were entered into MS Excel spreadsheets where the number of salmon migrating upstream on bank (b) in hour (h) was estimated by

$$N_{bh} = 60 \frac{(n_{u(n)} - n_{d(n)}) + (n_{u(o)} - n_{d(o)})}{10}. \quad (1)$$

All 24 hourly estimates for a calendar day were summed to estimate daily fish passage (N_{bd}) for each bank (b), i. e.,

$$N_{bd} = \sum_{h=1}^{24} N_{bh} . \quad (2)$$

Then, the fish passage estimates for both banks were summed to estimate the total daily fish passage (N_d).

Estimating Missing Data

When temporary equipment failure or intentional shutdowns for maintenance resulted in missing data for a given bank, hourly fish passage for any given hour (\bar{x}_y) was estimated by averaging valid counts for the same bank in adjoining hours, usually 1 hour before and 1 hour after (\bar{x}_y):

$$\bar{x}_y = \frac{\sum s_{(xz)}}{n_{(xz)}}, \quad (3)$$

where

$$\begin{aligned} \sum s_{(xz)} &= \text{sum of all valid counts in adjoining hours of } \bar{x}_y, (xz), \text{ and} \\ n_{(xz)} &= \text{number of valid adjoining hours of } \bar{x}_y, (xz). \end{aligned}$$

If a sonar unit did not operate for more than a day because of electronic problems or high water, a ratio of fish passage estimates between banks was used to estimate missing daily data. For example, if the daily estimate for Bank 1 was unobtainable, daily fish passage was estimated from the ratio of the fish passage between banks for the previous 3 days and the fish passage on the opposite bank, i. e.,

$$\hat{N}_{1d} = \left(\frac{\sum_{d=1}^3 N_{1d}}{\sum_{d=1}^3 N_{2d}} \right) \cdot N_{2d} . \quad (4)$$

Species Apportionment

Fish wheels operated on the north banks of the Kenai and Kasilof rivers, and both banks of the Yentna River to catch fish for apportionment purposes and to collect ASL information from sockeye salmon (Figure 5). Tissue samples from Yentna River were collected from sockeye salmon for genetic analysis. All fish wheels were of similar design consisting of framework that supports aluminum or foam-filled plastic floats, an axle, and a livebox. Partitioned, custom-made aluminum floats, prevented the fish wheel from sinking should a float develop a leak. Two baskets and 2 paddles were mounted to the axle at 90° angles to each other that rotated in the river. As the axle rotates in the current, the baskets scoop fish from the river, dropping them in a livebox mounted to the outside of the fish wheel frame. The baskets were fitted with 2–2.5 in (5–6 cm) tarred netting and a slide, which funneled the fish toward an opening in the basket netting and into the livebox. The livebox was mostly submerged in the river, where a constant flow of freshwater kept fish alive and vigorous. All fish wheels were anchored to shore using a boom (either a wooden or steel 4 x 4) to station the wheel in current deep and fast enough to allow the axle to turn. The baskets rotated as close to the bottom as possible where most fish migrate.

Cables or rope secured the front end to shore and kept the fish wheel parallel to the current. Depending on current, spinning speed of the fish wheel ranged between 2 and 5 revolutions per minute (rpm) with optimum speed at 3–4 rpm (any slower or faster reduced its effectiveness). A short weir, 3–6 m wide (depending on river) with pickets spaced no more than 7 cm to 8 cm apart, extended from shore diverting nearshore fish toward the spinning baskets. These weirs were either aligned with or just downstream of the axle or immediately below the fish wheel (nearshore) float. At some sites it was practical to extend the weir immediately below the wheel, past the inshore float, to prevent fish from passing under the fish wheel float and avoiding the catch zone.

In 2014, the Kasilof River fish wheel, located 75 yards downriver of the DIDSON on the north bank, was positioned under the Sterling Highway Bridge for the first 2 weeks of operations, then relocated 30–40 m upriver when the water level was higher. The wheel fished more effectively from start to finish when fished in these locations.

The primary objective of the project is to estimate sockeye salmon escapement, but escapement estimates will also be reported for coho, pink, and chum salmon without variances. Kenai or Kasilof river sonar counts are not apportioned until the daily species composition of the fish wheel catch is at least 5% pink and/or coho salmon and the evidence of a trend is obvious. This guideline was developed to accommodate situations where run timing of sockeye and pink salmon (and sometimes coho salmon) overlap, usually during even-numbered years. All daily sonar estimates were apportioned for the Yentna River because pink, chum, and coho salmon passage occurs throughout the sockeye run.

At the Kenai and Kasilof rivers, the daily escapement of each salmon species (N_{sd}) was determined by multiplying the total daily fish passage estimate (N_d) by the proportion of each species captured in the fish wheels (p_s), i. e.,

$$N_{sd} = N_d \cdot p_s. \quad (5)$$

When the fish wheel catch was low (<20 fish) or did not operate during a 24 h period, the catches from the 2 previous days were combined with the low catch to estimate p_s . The abundance of non-salmon in fish wheel catches, such as rainbow trout (*O. mykiss*) and whitefish (*Coregonus* spp.), are typically less than <1%; therefore, these fish are not apportioned from the total sonar count.

A simple method for observing relative abundance and catch efficiency of any given fish species and gear type was determined by calculating catch per unit effort (CPUE)

$$CPUE = \frac{c}{e}, \quad (6)$$

where

c = total number of fish caught, and

e = total number of hours each fish wheel or gillnet was fished.

On the Yentna River, fish wheels are operated on both banks, and fish wheel catches were used to apportion the sonar counts by bank. Species selectivity of the Yentna River fish wheels has been a persistent concern. Beginning in 2009, fish wheel selectivity coefficients derived from studies on the Susitna (ADF&G 1983) and Taku rivers (Meehan 1961), and Flathorn station in

2012, were factored into daily (total) fish wheel catches to determine a minimum-maximum escapement range for Yentna River sockeye, pink, chum and coho salmon (Table 1).

The lowest and highest of 7 estimates were used to establish the escapement range for each species ($n_{rs(i)}$). The coefficient-adjusted daily escapement was estimated by

$$N_{rs(i)} = \left(\frac{\frac{F_{(rs)}}{c_{i(rs)}}}{\left(\frac{F_{(rs)}}{c_{i(rs)}} \right) + \left(\frac{F_{(ps)}}{c_{i(ps)}} \right) + \left(\frac{F_{(cs)}}{c_{i(cs)}} \right) + \left(\frac{F_{(ss)}}{c_{i(ss)}} \right)} \right) N_d, \quad (7)$$

where

- $F_{(rs)}$ = daily fish wheel catch of sockeye salmon,
- $F_{(ps)}$ = daily fish wheel catch of pink salmon,
- $F_{(cs)}$ = daily fish wheel catch of chum salmon,
- $F_{(ss)}$ = daily fish wheel catch of coho salmon,
- $c_{i(rs)}$ = fish wheel selectivity coefficient for sockeye salmon,
- $c_{i(ps)}$ = fish wheel selectivity coefficient for pink salmon,
- $c_{i(cs)}$ = fish wheel selectivity coefficient for chum salmon, and
- $c_{i(ss)}$ = fish wheel selectivity coefficient for coho salmon.

Variance of Sockeye Salmon Passage Estimates

The variance of the sockeye salmon passage estimate on bank (b) and day (d) and systematic sampling time and adjustments for missing data was approximated using Wolter's (1985) successive difference method, i. e.,

$$\hat{V}[\hat{N}_{bd}] \equiv (1 - \frac{1}{j}) \cdot \left(\frac{1}{m} \right) \cdot \left(\frac{1}{3.5(m-4)} \right) \cdot \sum_{h=5}^m \left(\frac{N_{bh}}{2} - N_{bh-1} + N_{bh-2} - N_{bh-3} + \frac{N_{bh-4}}{2} \right)^2, \quad (8)$$

where m was the number of hourly counts in a day (usually 24) and j was the hourly sampling expansion factor (usually 60 minutes/10 minutes = 6). If sonar count data were missing in a day, the sample size (m) was adjusted accordingly. The total variance on day (d) was estimated by summing the variances from the 2 banks.

When total daily fish passage estimates were apportioned to species using fish wheel catches, the daily variance (Goodman 1960) was estimated by

$$\hat{V}[\hat{N}_{sd}] = \hat{N}_d^2 \cdot \hat{V}(\hat{p}_s) + \hat{p}_s^2 \cdot \hat{V}(\hat{N}_d) - \hat{V}(\hat{p}_s) \cdot \hat{V}(\hat{N}_d). \quad (9)$$

The variance of the sockeye salmon passage estimate for the season was estimated by summing the daily variances. The 95% confidence intervals on the total sockeye salmon passage estimate were estimated as described by Zar (1984).

AGE, SEX, AND LENGTH COMPOSITION

Sample sizes for estimating ASL compositions were 0.1% of the previous day's sockeye salmon escapement estimate on the Kenai River and 0.2% on the Kasilof River. A single scale from sockeye salmon for age analysis was collected from a preferred area on the left side of each fish, on a line between the posterior edge of the dorsal fin and anterior portion of the anal fin about 2 or 3 scale rows above the lateral line. If the preferred area was scarred or void of scales, the scale was either taken in front of the preferred area or from the same spot on the right side of the fish. Lengths were measured from mideye to tail fork (METF). ASL information and genetic samples were collected from every sockeye salmon captured by the Yentna River north bank fish wheel and from every fifth sockeye salmon captured by the south bank fish wheel during each of 3 sampling periods (1 hour duration).

YENTNA RIVER GILL NETTING

This was the third year that a drift gillnet test fishery was conducted in the Yentna River to determine the feasibility of replacing fish wheels to apportion sonar counts. Another year or more of comparison studies may be needed before any decisions can be made about the feasibility of this method. The method was similar to that used on the Nushagak River with some modifications (Brazil and Buck 2010). For instance, a net with mesh size 12.1 cm was used instead of a 20.6 cm mesh net because of the abundance of small salmon in the Yentna River. Because all drift gillnetting was done within 30 m of each bank and not midriver, nets were 10 m long instead of 18.3 m and drift times were less than on the Nushagak because of time and budget constraints.

Drift gillnet sizes 12.1 cm, 13.0 cm, and 15.2 cm were fished along each bank during each of 3 sampling periods/day. Period 1 covered the hours between 0600 and 1200, period 2 between 1200 and 1800, and period 3 between 1800 and 2400. Equal time and number of drifts for each mesh size was attempted during each sampling period. Each gillnet was 10 m in length, approximately 4–5 m deep and constructed of #12 mono twists filament webbing, EF-6 floats, and 85/100 lead line.

Gillnet catches needed to be as representative as possible of fish passage within the ensonified zone of the DIDSON, so drifting was restricted to those areas. Test fishing was conducted within 30 m of shore and at least 30 m downstream of the transducers and/or fish wheels along both banks, to avoid catching fish that were aggregated below the weirs. Each drift was called a set and began as soon as the crew deployed the net and ended when the net was pulled. Test fishing along each bank occurred in each of 3 periods per day. For each period and each mesh size as described above, 6–10 minutes of fishing was conducted. The crew was allowed to adjust fishing time to give priority to other project needs, but equal fishing effort was maintained among mesh sizes as much as possible. No fishing was conducted in the dark because of safety concerns.

The gillnet apportionment method was similar to that used to apportion daily sonar counts by bank using fish wheel catches (Equation 5). Averages were used to apportion sonar counts for any day gillnet fishing was not conducted or the catch (sample size) for the day was <20 fish. Averages were calculated using catches 3 days before and/or 3 days after affected days, depending on availability of data. For comparison, sockeye salmon abundances were estimated using 4 methods: (1) apportionment using total daily gillnet catches for all mesh sizes combined, (2) apportionment using total daily fish wheel catches (Equation 5), (3) the average of daily

gillnet and fish wheel apportioned abundance estimates, and (4) apportionment using the total daily CPUE for gillnets and fish wheels combined. Test fishing drifts were converted to hourly catch rates and CPUE was estimated for gillnet and fish wheel catches by multiplying the total daily catch per hour by 24 hours.

OBSERVER VARIABILITY

Counting variability among observers at the Kenai and Kasilof river sites was examined in 2014 to evaluate sources of error in fish passage estimates and help train sonar staff. One source of error arises from counting moving fish from a video in a timely manner for inseason management. Previous studies by Westerman and Willette (2011) indicated that differences among observers increased for rivers with higher densities, especially for the Kenai River. Observers recounted 24 (Kasilof) or 35 (Kenai), 10 min DIDSON subsample files recorded during or near the peaks of the Kenai or Kasilof river runs. The Kenai and Kasilof observer crews counted files from 2012 to 2013 to familiarize themselves with counting in preparation for 2014. Rather than use a single observer as a benchmark with which to compare other observers, average crew counts were used as the benchmark for each of the subsamples compared. Counts were primarily done from nearshore (1–10 m) subsample recordings (both banks) where fish abundance and the likelihood of error were greater than less abundant offshore subsamples. The number of fish per subsample in all Kenai River files ranged between 40 and 1,500 fish; Kasilof River counting files ranged between 20 and 600 fish. Observer counts were stratified for every 100 fish based on averages (Equation 10) of each sample (100–199, 200–299, etc.), then averages determined from these strata were compared against those of each observer.

For each river, the number of fish counted by each observer per subsample was compared against the crew average for that subsample

$$\bar{f}_i = \frac{\sum f_i}{n_i}, \quad (10)$$

where

\bar{f}_i = average number of fish for a given subsample (i),

$\sum f_i$ = sum of fish counts of all observers for a given subsample, and

n_i = number of observers for a given subsample.

The number of observers in each crew (x) was 3 for Kasilof and 5 for Kenai. The observer average of all subsample counts (24, in the case of Kasilof) was also compared to the crew average of all subsamples (24_x)

$$\bar{F}_o = \frac{\sum f_o}{24x}, \quad (11)$$

where

\bar{F}_o = average of all observers, and

$\sum f_o$ = sum of all subsample counts for all observers.

The standard deviation (SD) provided a measure of error between observers, and correlation (R^2) values indicated the relationship between an individual's subsample count and the average of the crew for that same subsample. These values were compared against the averages for each sample and for all samples ($n = 24$).

CESSATION CRITERIA

Sonar operations end on the Kenai and Kasilof rivers when daily escapements meet cessation criteria of $\leq 1\%$ of the total cumulative estimates of sockeye salmon for 3 consecutive days. Sonar operations on the Yentna River end when a combined sockeye salmon estimate from gill nets and fish wheels are less than 1% for 3 consecutive days. The cessation criteria for the Kenai and Kasilof River sonar enumeration projects are not be applied until after the closure of commercial fishing within the Kenai, Kasilof, and East Forelands sections. Exceptions to this criterion may be made if budgetary constraints and/or environmental factors such as high water put equipment or personnel at risk and the run was near the historical end dates as well as close to the 1% cessation criteria.

STREAM SURVEYS

When seasonal ADF&G staff are available and weather conditions are favorable, stream surveys are scheduled during the historical sockeye salmon peak escapement periods for Quartz and Ptarmigan creeks. Quartz Creek peak run periods occur in mid to late August and Ptarmigan Creek peak runs occur in the first part of September. A stream survey consists of walking in or along the water way counting live and dead fish with hand held tally whackers. These counts provide an index of abundance. There is not enough staff and time to conduct frequent surveys during the course of the sockeye salmon escapement, therefore there is no statistical analysis completed for index counts which occur in a single counting survey.

CLIMATOLOGICAL DATA

Water and air temperatures, water depth (staff gauge), and general weather conditions were recorded at each of the sonar sites. Turbidity or water clarity (Secchi disc) was measured in the Kenai River, but not in the Yentna or Kasilof rivers due to their low clarity.

RESULTS AND DISCUSSION

Objectives 1 and 2 regarding escapement enumeration were met because conditions were adequate for the use of sonar to estimate salmon escapement in each of 3 river systems in UCI because 1) most sockeye salmon migrate near shore (<10 m) within range of a transducer beam and near the bottom; 2) salmon densities were challenging but not overwhelming in the Kenai, Kasilof and Yentna rivers; 3) processing of DIDSON files were completed in a timely and reasonably accurate manner; and 4) the acoustic size of migrating fish and TS were within detection thresholds of DIDSON as demonstrated by Maxwell and Gove (2007; Tarbox and King 1991), where target strengths of (tracked) salmon averaged -32.2 dB in the Copper River and between -32.0 and -32.4 dB in the Yentna River. These TS were well above the minimum thresholds for DIDSON, which have detected calibration spheres of -38.1 dB and -43 dB. Objective 3 was also met. Fish wheels operated in a sufficient manner to adequately catch sockeye salmon for ASL compositions and estimates.

KENAI RIVER

The largest documented sockeye salmon counts occurred in the Kenai River in 1987 (the Glacier Bay oil spill, 2.2 million fish) and 1989 (the Exxon Valdez oil spill, 2.3 million fish), when commercial fishing was restricted for part or all the fishing season. In comparison, the Kenai River sockeye salmon escapement in 2014 was estimated at 1,520,340 (95% CI: 1,494,105–1,546,575) with a relative error of 1.7%. The 2014 escapement was the ninth highest estimate (Tables 2 and 3) since 1979 exceeding the inriver goal of 1.0–1.2 million sockeye salmon, a goal based on a Kenai River run of 3.8 million fish (Munro and Tide 2014). Prompted by speculation that the fish wheel apportionments for sockeye and pink salmon were not accurate, this estimate was derived after a postseason adjustment to August fish wheel catch apportionments.

Inriver drift gillnetting catches were compared to fish wheel salmon catch proportions. Salmon species compositions estimated from drift gillnet catches differed from fish wheel catches with various results day to day. In general, when gillnets were drifted tight to shore, within the 10 m sonar sampling strata, results resembled fish wheel catches, but when drifted in offshore sonar strata, catch percentages increased for pink salmon and decreased for sockeye salmon. Beginning 1 August, DIDSON counts ranging 1–10 m from shore were apportioned using the fish wheel catch percentages and counts ranging from 11 m to 30 m were apportioned using the gillnet catches. Employing this method, original estimates for sockeye salmon decreased 2.5%, pink salmon increased 5.8%, coho salmon decreased 0.01%, and Chinook salmon increased 28.2%. The pink salmon escapement was the largest since 1980, regardless of apportionment methodology, and the second earliest since 1998 when the 5% rule for apportioning sonar counts was implemented (Table 4). Sonar counts are not typically apportioned until the daily species composition of the fish wheel catch is at least 5% pink and/or coho salmon and the evidence of a trend is obvious.

Pink, coho, and Chinook salmon apportioned from the total sonar estimate were not indicative of run size because the project operational period did not coincide very well with the complete run timing of these species. Tarbox et al. (1983) identified difficulties with enumerating these species with sonar and apportionment related to the sonar site's specific location. Observations using sonar and sampling techniques historically indicate that late season coho and pink salmon apparently have spatially broader migration patterns than sockeye salmon and that Chinook salmon tend to migrate further from shore. Additionally, Chinook and pink salmon spawn within the locations of the sonar and fish wheel placement increasing enumeration difficulties. When Bendix sonar counters were previously used on the Kenai River, a 'rock inhibitor' was used to compensate for stationary or spawning salmon and blocked them from being enumerated. Because of the use of DIDSON, stationary or spawning salmon are visually identified and then ignored during counting procedures. The fish wheels function only to catch migrating fish for apportionment and ASL sampling and do not target resident or spawning fish during sampling.

Errors associated with using gill nets to apportion salmon at the sonar's location may include 1) fish wheels tend to select for pink salmon; 2) gillnetting as a apportionment tool has not been fully tested on the Kenai River; 3) gillnetting is difficult in swift water, especially when steering skiffs in nearshore strata; 4) Chinook and pink salmon spawning and resting within the gillnetting area results in the same fish repeatedly caught; and 5) intentionally migrating fish travel tighter to shore. Finally, comparisons between species compositions of fish wheel catches at the Kenai River sonar site and Cook Inlet commercial gillnet catches may not be appropriate

because of gear type differences and significant numbers of pink salmon spawn below the sonar site and the migratory behavior of salmon from Cook Inlet into the Kenai River varies from year to year.

Most of the escapement (~80%) occurred within a 30-day period, beginning 10 July, with the midpoint of the escapement on 29 July, 6 days later than the historical average since 1979 and 6 days later than the average for 1999–2013 (Table 5). The escapement peaked on 5 August when ~112,000 sockeye salmon passed the sonar site and lesser pulses preceding on 21 July (~64,000 fish) and 31 July (~67,000; Figure 6). Frequently the Kenai River sockeye salmon escapement comes in several peak periods throughout the run. Sockeye salmon are commonly observed as late July or early August escapement peaks. Observed in even (pink salmon) years and odd years, these late season peaks occur at a time when commercial fishing effort is declining and other salmonid runs are prevalent. Apportionment of species began 1 August, 4 days earlier than the historical average. Run timing was similar for both banks with a higher percentage (55%) of fish migrating along the south bank (Table 6; Appendices A1–A2). However, fish distribution from shore differed by bank because of differences in depth and bottom profile (Table 7). During the first week of July, <20% of the fish migrated within 0–10 m of the north bank transducer compared to >80% within 0–10 m of the south bank transducer. During the second week of July, the water levels rose and fish migrated closer to shore along each bank, and by 19 July >75% were passing within 10 m of the transducer on the north bank and >96% on the south bank. Later in July, with waning water levels, fish moved back offshore on the north bank and the south bank distribution remained the same for the duration of the run. North shore fish migration returned onshore when water levels rose in August. Typically in August, when pink and coho salmon densities increase, a few more salmon are observed moving beyond 10 m along the north bank and occasionally along the south bank. However, in 2014 near shore orientation increased or was sustained during the later portion of the run as water levels increased. Subsample counts for the entire season indicated ~70% of the north bank fish and ~97% of the south bank fish migrated within 10 m of each transducer.

After mid-July, approximately 125 fish observed on the south bank were Chinook salmon, based on their size and swimming behavior observed in DIDSON images. A few Chinook salmon were also observed beyond 20 m of the north bank but were usually intermixed with other salmon.

Average hourly passage trends were relatively similar between the north and south bank (Figure 7; Appendices A3–A4). Salmon passage rates met or exceeded a constant or average daily rate of 4.2% (the average percent hourly passage rate for a 24 h period) during the mid-afternoon or evening hours along both banks. Fish passages were lowest throughout the morning hours along both banks.

The Kenai River fish wheel caught 4,447 salmon, comprised of pink (35.8%), coho (1.3%), and Chinook salmon (.4%), with sockeye salmon (62.4%) as the predominant species (Table 8). The fish wheel catch is typically >85% sockeye during even-numbered years, making this the second lowest percentage of sockeye salmon since 1978, which may be due to a strong run of pink salmon early in August (Table 9). Estimates for species other than sockeye salmon have limited value as indices of total passage because (1) their run continues beyond the operational time frame of the project and (2) fish wheel avoidance (e.g., Chinook salmon). Most Chinook salmon do not migrate near shore and are frequently observed in the outer ranges (10–30 m) of DIDSON. Total CPUE effort for sockeye salmon (4.6 fish per hour) was less than the historical

average for an even year (Table 9). Total CPUE for all species was nearly average for an even year.

The predominant age components of the sockeye salmon escapement in the Kenai River were age 1.3 (63.5%), 2.3 (15.3%) and 1.2 (12.3%) fish based on a sample of 498 (Table 10)². Age 2.2 fish (7.2%) were also abundant. Age 1.3 fish averaged 563 mm, 2.3 fish averaged 565 mm and 1.2 fish averaged 457 mm, which was slightly below average for each age class (Table 11). The average length for all age classes combined was 543 mm, which was within the historical range of 488–576 mm. The male to female ratio (0.9:1) was consistent with the average historical ratio.

The biggest challenge for any observer to counting fish from Kenai River image files, more so than any other sonar escapement project in UCI, was an ability to detect individual fish within high densities of fish. High densities of swimming fish created acoustic shadowing effects that often masked fish passing side by side and made it difficult to keep track of moving images. The closer to the transducer high densities of fish passed, the more profound the problem. Observers were able to counter this problem by adjusting the frame rate (playback speed) and intensity on the computer to detectable levels. In practice, the playback speed could be slowed down when high densities of fish were being observed, allowing the technician to count more accurately. This was a big concern on the south bank, where often many fish were tightly packed within 2–5 m of the DIDSON transducer throughout the peak of the run, creating these shadowing effects. On the north bank, fish were more evenly distributed throughout the detection range of the DIDSON posing a different problem; that is, “mentally” tracking fish and remembering which fish were counted as they were observed moving across the computer screen. Masking and distribution problems were not always exclusive to one bank or the other; many times these problems were prevalent on both sides of the river. The lower image quality on the north bank due to the long range requirement and capabilities of the particular DIDSON unit was mitigated by viewing images with a slower frame rate. Efforts to lessen these high density effects included lengthening the weir 1–2 m to push fish farther away from the transducer and re-aiming the DIDSON unit to provide a better viewing angle.

The Kenai River, a glacially fed river, rose 0.8 m throughout the sonar season and was highest during the middle of July and August, interspersed by a low period the end of July and early August (Table 12; Figure 8). Water levels dropped at a time when water levels typically begin to increase or level off in midsummer. As a result water level was lowest on 3 August with water clarity reaching a secchi depth of 55 cm, which coincided with peak salmon passage. Overall water clarity in 2014 (Secchi depth = 82 cm) was slightly below the 1979–2013 average. Air temperature was about 3/4°C warmer than the average for the period 1987–2013. Fish distribution from shore was affected by water level as the shallower water dispersed fish throughout the sonar range and farther from shore on the north bank.

KASILOF RIVER

The Kasilof River sockeye salmon escapement estimate in 2014 was 440,192 (95% CI: 438,380–442,003) with a relative error of 0.4% (Table 13). The 2014 escapement into the Kasilof River was the fourth highest documented escapement since 1983, exceeding the upper limit of the OEG (160,000–390,000). Seven of the highest documented escapements into the Kasilof River

² European aging system indicated by freshwater years, followed by years in ocean.

have occurred in the last 10 years with the highest estimated escapement of those occurring in 2013 when about 490,000 sockeye salmon passed the Kasilof River sonar counters. Kasilof river sonar counts are usually not apportioned because of a low percentage (<2%) of other species in daily fish wheel catches. However, due to the strongest historical showing of pink salmon, based on fish wheel data going back to 1983, daily counts were apportioned beginning 1 August.

Fish migration was slightly early in 2014. The midpoint of the escapement occurred on 11 July, 4 days earlier than the historical average (1979–2013) and the majority of the escapement (80%) passed the counting site in 40 days, 2 days later than the historical average (1979–2013) (Table 14). Two substantial peaks in June exceeding 17,000 fish occurred on 19 June and 26 June, and were followed by subsequent peaks in July exceeding 16,000 fish on 15 July, 18 July and 21 July (Figure 6). Approximately 62% of the fish were estimated to have migrated along the north bank which was higher than the historical average of 58% for all years since 1979; (Table 6; Appendices B1 and B2). For unknown reasons, increasing percentage of fish passage along the north bank was the trend from 2005 to 2011, but has since then has shown a slow decreasing trend. Prior to 2005, fish were either south bank oriented or split evenly between the banks.

A moderate percentage of fish migrated between 10 m and 30 m in late June on both banks but with higher water, fish became more shore oriented (<10 m) by mid-July and August (Table 7). By 6 July, ~93% of the fish were passing within 10 m of the transducer along the north bank and south bank. By 3 August, ~100% of the fish were within 10 m of the transducer on both banks. For the season, 97.1% of the fish passed within 10 m of the north bank transducer and 83.7% were within 10 m of the south bank transducer.

The run along the south bank was nearly the opposite that of the north with the greatest portion of the run occurring after midnight and into the early morning hours, then declining during mid-day throughout the afternoon and evening hours. The north bank tended to increase from mid-morning and throughout the day, declining substantially after midnight (Figure 7; Appendices B3 and B4). This difference might indicate crossing over behavior somewhere downstream of the sonar site or tidal influences upon entry into the river mouth.

The fish wheel operated for 558 hours and caught a total of 2,467 salmon for a CPUE of 4.4 fish/h, higher than the historical average of 3.7 fish/h (Tables 15 and 16). Due to rising water levels the fish wheel was moved upstream 3 July. Salmon passage rates fluctuated for 2 weeks following this move and subsequently catch rates fluctuated. When salmon passage rates resumed in mid-July, the catch rates increased and remained steady as well. The percentage of sockeye salmon in the catch (~92%) was below the 97% historical average of the project (1983–present) and was due to the high percentage of pink salmon.

The fish were more susceptible to capture during the evening and night time hours, which may be due to abundance or run timing along the north bank and/or environmental factors. Compared to other glacial rivers, the Kasilof fish wheel CPUE was slightly less than Kenai River, and much less than Yentna River.

Sockeye salmon escapement age composition in the Kasilof River was mainly age 1.2 (42.4%) and 1.3 (29.4%) with several 2.2 (20.6%) also present ($n = 524$; Table 17). Average lengths were 465 mm (age 1.2), 478 mm (age 2.2) and 535 mm (age 1.3) sockeye salmon (Table 18). Average length for all age classes was 486 mm. The male to female ratio of 0.95:1 was above average (0.8:1) for this river.

Average water temperature was cooler than the historical average and water level rose 1.1 m during the run, slightly above average for the Kasilof River (Table 12). Turbidity measurements were not taken in 2014 and no unusual clarity observations were reported. Fish wheel CPUE may be affected when higher water clarity improves visibility, which allows fish to avoid capture. Environmental factors did not appear to influence salmon run timing although water level influenced fish distribution and fish wheel operations. As water level rose, water velocity increased, so fish took the path of least resistance near the banks. High water and faster current makes operating the fish wheel more difficult and lowers catch efficiency.

YENTNA RIVER

The final inriver escapement estimates for Yentna River ranged between 56,000–137,000 sockeye, 40,000–137,000 pink, 20,000–59,000 chum, and 36,000–151,000 coho salmon (Table 19). Between 2010 and 2012, the time frame for operating the escapement project was 7 July to 15 August, which adequately coincided with run timing for each of the aforementioned salmon species. Preceding 2010 and subsequent to 2012, final apportioned escapement estimates for other salmon were not representative of true escapement strength, because the project ended earlier to match sockeye salmon run timing and not that of other species. Factors influencing the accuracy of escapement estimates for pink, coho, chum, and Chinook salmon in the Yentna River have been discussed by Tarbox et al. (1981, 1983). Escapement range estimates for sockeye salmon were probably a conservative indicator of run strength because of biases in sonar estimates of total salmon abundance (Maxwell et al. 2013) and fish wheel selectivity.

The midpoint of the sockeye salmon escapement occurred 21 July, which is 2 days before the historical average for 1981–2013 (Table 20). It took 18 days for 80% of the escapement to pass the Yentna River sonar site, 1 day shorter than the average for 1981–2013. Sockeye salmon escapement peaked between 19 July and 21 July (Figure 9). Pink salmon escapement peaked between 18 July and 20 July, chum salmon on 30 July and 2 August, and coho salmon on 21 July and 2 August.

The passage of fish along the south bank (~88–90%) was greater than the north bank in 2014, which was typical for a river that has averaged 79% passage along the south bank (1985–2008; Table 6). South bank run estimates consisted of about 7–10 times more sockeye, 1–2 times more pink, 1–2 times more chum, and about 4 times more coho salmon compared to the north bank (Appendices C1 and C2). One possible explanation for bank preference is that most salmon in the Susitna River are oriented to the west bank at Flathorn station, which is 5 miles below the confluence with the Yentna River (Yanusz et al. 2011). It is possible that many of the Susitna west bank fish stay along the south bank after they move into the Yentna River, at least as far as RKM 9.2. This would be especially true of fish bound for spawning streams flowing into the Yentna River from the south rather than anadromous streams flowing into the Yentna River from the north. Fish that spawn in north bank tributaries are the only fish that would need to crossover to the north bank.

Hourly fish passage rates followed a daily cycle along both banks where a constant rate (4.2%) was exceeded intermittently throughout late morning and into evening hours. North bank fish passage sharply increased late in the evening and into the early morning hours, at which time both banks experienced a decrease until late morning (Figure 10; Appendices C3 and C4). The highest north bank passage rates occurred between 2300 and 0200 (25%) and between 1000 and 1900. Fish passage on the south bank exceeded a constant rate during the same hours as the north

bank with the highest passage rates occurring between 1400 and 1700. Between 2009 and 2012, the (hourly) passage of salmon was temporarily slowed by near-constant fish wheel operations on both banks (Westerman and Willette 2013). Persistent fish wheel operation was repeated in 2014, and this hourly passage behavior recurred with some of the highest fish passage estimates on both banks occurring when the fish wheels were not operating between the hours of 2200 and 0300, between 0900–1000, and 1700–1800. Fish passage at the sonar increased sharply when fish wheels stopped and then declined when fish wheels were activated. These peaks were not present or as distinct between 2002 and 2004 when fish wheels operated for about one-third of the time they were operated in 2009–2012 (Figure 11). This disruption of fish movement was probably temporary, assuming fish did not move offshore and beyond sonar range because of fish wheel activity. The effect this may have had on total daily escapement estimates, if any, is unknown. In 2013, fish wheel operations accomplished shorter daily regimens and fish passage was similar to patterns as seen in 2002–2004, exhibiting less exaggerated passage peaks when fish wheels were not operating.

Maintaining sonar and fish wheel operations during high water events has always been a problem on the Yentna River. Earlier examinations of fish wheel efficiency in relation to Bendix sonar counts indicated that as water level increased, fish wheel efficiency improved but sonar counts often decreased. Davis (1998) found that the Yentna River south bank fish wheel efficiency was high when Bendix sonar counts were low, an indication that the south bank counter was undercounting. Westerman and Willette (2007a-b) determined that fish wheel efficiency was significantly positively correlated ($p < 0.05$) with water level in 4 years (2002–2005) on the south bank and in 2 of 4 years on the north bank. These patterns were consistent with changes in fish behavior during periods of high water, apparently causing fish to be more vulnerable to capture by the fish wheel. A similar event occurred in 2011 and to a lesser extent during the last week of July 2012, when low escapement estimates briefly coincided with rising water levels. Comparatively, peak passage rates appeared to coincide with minor rises in water levels in 2014 during the latter half of the run (Figure 12).

Most salmon were shore-oriented on both banks throughout the season with an average of ~82% (daily) passing within 10 m of the transducer on the north bank and ~90% on the south bank (Table 7). The percentage of fish nearest shore (1–10 m) on both banks was lowest during the first week of August when fish densities were waning and highest in July as densities increased.

In 2014, the north bank fish wheel caught about 15 salmon per hour, with catches consisting mostly of sockeye (9.1%), pink (67.7%), chum (11.7%), and coho salmon (11.1%; Table 21). Catch percentage for sockeye salmon was two-thirds its historical average for the north bank, whereas pink salmon was average (Table 22). The south bank fish wheel CPUE was below its historical average but was still slightly greater than the north bank, which has been typical for the Yentna River since fish wheels were first used on the river in 1982 (Table 23). The south bank fish wheel averaged 16 salmon per hour with catches consisting mostly of sockeye (32.8%), pink (40.2%), chum (7.6%), and coho salmon (19.3%). Sockeye salmon catch was 24% higher than its historical average, whereas pink salmon catch was nearly 24% less (Table 24). The percentage (11.7%) of chum salmon on the north bank was slightly above average (8.7%), but catches matched the historical average (7.8%) on the south bank. Coho salmon catches were higher (11.1%) than average (8.9%) on the north bank and also higher (19.3%) on the south bank than the average of 12.9%.

The age composition of Yentna River sockeye salmon consisted mostly of age 1.3 (33.3%), 2.3 (10.2%), 1.2 (39.4%), and 2.2 (12.4%; Table 25). Age-1.2 and -2.2 sockeye salmon were above historical averages, and the age-1.3 sockeye salmon were below average. Average lengths for these age classes ranged between 462 mm and 570 mm (consistent with historical averages) and the ratio of males to females was 1.3:1 (Table 26). Although the male to female ratio is higher than average, it is still consistent with historical data for this river when age 1.2 ratios occasionally drive the average upwards.

The reliability of using fish wheels to apportion sonar estimates has been a concern in recent years because of possible species selectivity. A study by Meehan (1961) on the Taku River found that fish wheels were more efficient at capturing smaller Chinook (approximately sockeye salmon size) and pink salmon and less efficient at capturing coho and larger Chinook salmon (larger than sockeye salmon). In 1981 and 1982, ADF&G (1983) found that fish wheels on the Susitna River at Talkeetna and Curry stations were more selective for pink salmon and less for chum and Chinook salmon, with no apparent selectivity for coho or sockeye salmon. A problem with the use of fish wheels is that species selectivity may be dependent on specific site conditions (depth, flow, profile, etc.) where some sites are more conducive to the capture of certain species than others (for example, eddies might improve capture probabilities of pink salmon over other species). This may be the case with Yentna River fish wheels where environmental factors such as an eddy on the north bank and constantly fluctuating water levels influence species selectivity.

ADF&G conducted a study between 2009 and 2012 (Willette et al. 2016) to determine the extent Yentna River fish wheels are species-selective using methods similar to Meehan 1961. In summary, pink, sockeye, chum, and coho salmon were tagged in the lower Susitna River (at the confluence with the Susitna River) and recaptured in the Yentna fish wheels to test for differences in recapture probability among species over time. Information from Willette et al. (2016) will help determine in what manner fish wheels will or will not be used in the future for inseason management of Yentna River escapements.

Beginning in 2010 and continuing through 2014, the Yentna River sockeye salmon escapement was not used inseason for management purposes because of uncertainties associated with fish wheel species selectivity. In 2009, a Bendix-based Yentna sockeye salmon SEG was replaced with a weir SEG on Chelatna, Judd, and Larson lakes, 3 of the major sockeye salmon rearing lakes within the Susitna River drainage (Fair et al. 2009; Yanusz et al. 2011). Cook Inlet Aquaculture Association (CIAA) operated the weirs on these lakes from 2009 to 2012, and since then the weirs have been operated by ADF&G (CIAA 2012, 2013; Weber 2012a-b, 2013a-b). Sockeye salmon weir counts achieved the SEG range of 20,000 to 65,000 at Chelatna Lake (26,374), missed the range of 15,000 to 50,000 at Larson lake (12,430), and were below the SEG range of 25,000 to 55,000 (22,229) at Judd Lake (Table 27). The total sockeye salmon escapement for Chelatna and Judd was 48,603 sockeye salmon, below the DIDSON/fish wheel escapement range estimates (56,000–137,000) for Yentna River.

Water temperatures were 1°C higher than average for the Yentna River in 2014 (Table 12). Water level fluctuated up to 1.4 m during July, which was nearly average for records between 1985 and 2014 (Figure 12). Water clarity has always been very low—less than a few centimeters. In 2012, the crew took Secchi disk measurements inseason and verified that water clarity was consistently poor and averaged only 3.5 cm. Heavy silt load impairs the DIDSON lenses, reducing the visual acuity of images if not cleaned every 2 days and causing attenuation

problems reducing fish detection at longer ranges. Environmental effects on fish wheel operations have already been discussed.

YENTNA RIVER GILL NETTING

Test fishing with gillnets was conducted between 7 July and 8 August to determine if species apportionment using this method would provide more accurate estimates of sockeye salmon escapement. Potential drift areas were cleared of debris or potential snags by preliminary netting and to identify the best possible sampling sites along both banks. Nearly 50 hours of test fishing time were logged on the north bank with a total catch of 292 sockeye, 305 pink, 276 chum, 201 coho, and 1 Chinook salmon (Table 28). Nearly 50 hours of fishing time were also logged along the south bank with a catch total of 283 sockeye salmon, 198 pink salmon, 152 chum salmon, 304 coho salmon, and 1 Chinook salmon (Table 29). When data from all nets were pooled by bank, the percentages of sockeye, pink, and chum salmon along the north bank were relatively similar (26–28%), but not on the south bank. On the south bank the sockeye and coho salmon were similar (30–32%). Comparable to 2013, sockeye catches were similar regardless of bank, but contrasted with 2013 by slightly decreasing as mesh size increased. Pink salmon percentages were higher on the north bank (28.4%) than the south bank (21.1%), with catches diminishing as mesh size increased. Coho salmon percentages were higher on the south bank (32.4%) than the north bank (18.7%), analogous to 2012–2013. With the exception of the south bank sockeye, gill nets caught a higher percentage of sockeye, chum, and coho salmon, and 20–40% fewer pink salmon than were caught in the fish wheels. Regardless that pink salmon are typically even-year dominant in the Susitna River, fish wheel catch percentages 2012–2013 were similar. 2014 fish wheel catch percentages demonstrated an increase in sockeye salmon catches and a decrease in pink salmon catches. The 2 larger mesh sizes (13.0 cm, 15.2 cm) caught approximately the same percentages of sockeye salmon, and the 12.1 cm mesh caught more on both banks. The 15.2 cm mesh net caught a substantially higher percentage of chum salmon than the smaller mesh nets, and higher percentages of coho salmon were caught by the 12.1 and 13.0 cm mesh nets. Correlations (R^2) between CPUE by various mesh sizes and between banks were highest overall with the 13.0 cm mesh (Table 30). All salmon CPUE were more evenly dispersed among all mesh sizes on both banks in contrast to previous years where one or more species demonstrated a higher percentage.

A preliminary gillnet-apportioned sonar estimate of approximately 92,000 sockeye salmon escaped into the Yentna River (Appendix C5). This was compared to an estimate of 77,000 sockeye salmon calculated using the standard method (Equation 5) of apportionment using daily fish wheel catches. An average of the daily gillnets and fish wheel apportioned estimates was 84,000 sockeye. The combined gillnet and fish wheel CPUE apportioned estimate was 83,000 sockeye salmon (Appendix C5).

In 2012, Westerman and Willette (2013) discovered differences between the 2 catch methods, indicating gillnet apportionment of sonar counts provided a more consistent estimate of sockeye salmon escapement. The ratio between gillnet and fish wheel counts in 2012 was 3.8:1; in 2013, 2.8:1; and in 2014, 1.2:1. Continued disparity and year-to-year inconsistency necessitates additional studies and more detailed statistical analysis before drawing any conclusions.

OBSERVER VARIABILITY

DIDSON image files primarily from 2012 and 2013 ($n = 35$) were recounted by each Kenai River crew member to estimate count variability among observers using average counts as a comparison baseline. Most files selected for this comparison analysis (~71%) ranged between 200 and 900 fish/h (9% less than 200 fish and 18% greater than 900 fish). The overall average for each observer (average for 35 samples combined) correlated closely with the average range for the entire crew ($R^2 = 0.957\text{--}0.995$; Table 31). Comparative files ranged between 50 and 1,500 fish per file and averaged 624 fish ($SD = 27$). These same files when originally counted averaged 627 fish per file. Variability among observers increased as fish densities increased ($SD = 2.0$, <299 fish; $SD = 17.6$, 300–599 fish; $SD = 43.0$, 600–899; $SD = 65.8$ >900 fish) and were less consistent as sample densities exceeded 600 fish (Figure 13). Correlations among observer counts typically diminished as subsample counts increased: <300 ($R^2 = 0.997$), 300–600 ($R^2 = 0.857$) and 600–900 ($R^2 = 0.550$). In 2014, contrary to this trend, subsample counts greater than 900 fish had an R^2 of 0.959 (Figure 14). The original estimates ($R^2 = 0.975$) were lower than all but one of the 2014 averages. The trend up to 900 counts was similar in 2013 when observer differences were more variable at higher densities.

A nearly 1:1 relationship ($R^2 = 0.999$, $SD = 1.0$) existed between observers when counting identical image files from the Kasilof River (Table 31). Samples averaged 159 fish per file with one-third containing between 100 and 200 fish. Variability between observers was minimal because of low fish densities, but like the Kenai crew differences increased with higher fish densities (Figures 13 and 14). In general, overall average observer counts of subsamples containing 200 fish or more are most variable, and those subsamples containing <200 fish are least variable. Concurring with this observation, observer counts in 2014 were less variable for files containing <100 fish ($n = 11$; $SD = 1.0$) compared to those containing 100–199 fish ($n = 8$; $SD = 2.1$) and files containing >200 fish ($n = 5$; $SD = 2.6$) were most variable across the average observer count. Average observer counts were within 1 or 2 fish of the original counts made in the original files, which was a good correlation ($R^2 = 0.999$) among all observers. Unlike the Kenai River, spatial distribution and acoustic shadowing effects were not a problem for the Kasilof River crew because of lower fish densities. A counting standard of $\leq 5\%$ of the crew average was set to allow for some degree of error, and the Kasilof crew met that standard in 2014.

Yentna River crew did not count previous DIDSON files for continuing a baseline observer count variability comparison in 2014. Inseason sonar files were counted post season. Previous average counts per observer for all combined samples correlated closely with the crew average ($R^2 = 0.994\text{--}1.0$; $SD = 1.1$) and variability trends showed a slight increase as fish densities increased.

STREAM SURVEYS AND WEIR COUNTS

Stream surveys and weir counts were important indicators of run strengths in UCI in 2014. A foot stream survey was conducted on Quartz Creek by ADF&G, Division of Commercial Fisheries during the historical peak of sockeye salmon spawning activity (late August) to assess tributary escapements in the upper Kenai River drainage. All observed fish, living and dead sockeye salmon and other species of fish, were counted and evidence of predation noted. The Quartz Creek survey covered the lower 7.5 km of the creek starting at the Matanuska Electric Association substation on the Sterling Highway and ending at Kenai Lake. A foot stream survey

of the lower 2.5–3.0 km of Ptarmigan Creek was also conducted by Division of Commercial Fisheries. Other indicators of run strength in the upper Kenai River drainage (i. e., weir counts on the Russian River) were provided by the Division of Sport Fish and Cook Inlet Aquaculture Association (CIAA; weir counts from Hidden Creek). ADF&G, Division of Commercial Fisheries also operated weirs at Judd, Chelatna, and Larson lakes within the Susitna River watershed. The Division of Sport Fish in Palmer operated a weir on Fish Creek and conducted stream surveys (aerial and ground) on a number of Northern District streams and lakes.

Late run Russian River and Hidden Creek weir counts and stream surveys on Quartz and Ptarmigan creeks provided an upper Kenai River index of 102,381 sockeye salmon, about 6.7% of the estimated sockeye salmon migration past RKM 31 sonar site (Table 32). Stream survey counts were conservative because 1) unknown quantities of fish were observed in Kenai lake at the mouth of both Quartz and Ptarmigan creeks at the time of the surveys, 2) any fish in water >1.5 m deep were difficult or impossible to see, 3) early (or late) spawners were not counted because only one survey was conducted (sockeye salmon are often observed spawning in Quartz Creek as late as mid-October), and 4) many dead fish were observed, probably an indication that the survey was conducted late. A later survey of either creek was not conducted because of weather and budget constraints. The total late run Russian River weir and stream survey counts were 52,277 and 10,659 sockeye salmon, and the Hidden Lake weir count was 21,817. The late run Russian River escapement of sockeye salmon fell within the SEG for this stock (30,000–110,000) but was less than the 45-year average dating back to 1969. Correlations between combined survey/weir counts and sonar estimates ($R^2 < 0.25$) have never been strong (Westerman and Willette 2010a).

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TABLES AND FIGURES

Table 1.—Fish wheel selectivity coefficients for sockeye, pink, chum, and coho salmon from the Susitna River, 1981–1982 (coefficients 1–4), Taku River, 1958–1959 (coefficients 5–6), and Flathorn, 2012 (coefficient 7).

Species	Fish wheel selectivity coefficients						
	1	2	3	4	5	6	7
Sockeye	0.072	0.134	0.127	0.087	0.033	0.009	0.022
Pink	0.119	0.186	0.174	0.164	0.079	0.083	0.044
Chum	0.060	0.052	0.083	0.046	0.022	0.018	0.018
Coho	0.147	0.110	0.114	0.065	0.007	0.007	0.051

Note: Coefficients 1–4 (ADF&G 1983) and coefficients 5–6 Taku River (Meehan 1961) 1958–1959. Fish wheel selectivity coefficients are based on tag recapture probabilities.

Table 2.—Sockeye salmon escapement estimates (Bendix and DIDSON) for the Kenai, Kasilof, and Yentna rivers 1978–2014.

Year	Kenai R. ^a		Kasilof R. ^b		Yentna R. ^c	
	Bendix	DIDSON	Bendix	DIDSON	Bendix	DIDSON
1978	398,900	ND	116,600	ND	ND	ND
1979	285,020	412,978	152,179	ND	ND	ND
1980	464,038	667,458	184,260	ND	ND	ND
1981	407,639	575,848	256,625	ND	139,401	236,218
1982	619,831	809,173	180,239	ND	113,847	192,916
1983	630,340	866,455	210,271	215,731	104,414	176,932
1984	344,571	481,473	231,685	238,413	149,375	253,119
1985	502,820	680,897	505,049	512,827	107,124	181,524
1986	501,157	645,906	275,963	283,054	92,076	156,025
1987	1,596,871	2,245,615	249,250	256,707	66,054	111,930
1988	1,021,469	1,356,958	204,000 ^d	204,336	52,330	88,674
1989	1,599,959	2,295,576	158,206	164,952	96,269	163,130
1990	659,520	950,358	144,136	147,663	140,290	237,725
1991	647,597	954,843	238,269	233,646	109,632	185,774
1992	994,798	1,429,864	184,178	188,819	66,074	111,964
1993	813,617	1,134,922	149,939	151,801	141,694	240,104
1994	1,003,446	1,412,047	205,117	218,826	128,032	216,953
1995	630,447	884,922	204,935	202,428	121,220	205,410
1996	797,847	1,129,274	249,944	264,511	90,660	153,625
1997	1,064,818	1,512,733	266,025	263,780	157,822	267,433
1998	767,558	1,084,996	273,213	259,045	119,623	202,704
1999	803,379	1,137,001	312,587	312,481	99,029	167,807
2000	624,578	900,700	256,053	263,631	133,094	225,531
2001	650,036	906,333	307,570	318,735	83,532	141,547
2002	957,924	1,339,682	226,682	235,731	78,591	133,174
2003	1,181,309	1,656,026	359,633	353,526	180,813	306,392
2004	1,385,981	1,945,383	577,581	523,653	71,281	120,787
2005	1,376,452	1,908,821	348,012	360,065	36,921	62,563
2006	1,499,692	2,064,728	368,092	389,645	92,896	157,414
2007	867,572	1,229,945	336,866	365,184	79,901	135,394
2008	614,946	917,139	301,469	327,018	90,146	152,754
2009	745,170	1,090,055	297,125	326,285	ND	43,972–153,910
2010	970,662	1,334,769	267,013	295,265	ND	59,399–145,139
2011	ND	1,599,217	ND	245,721	ND	62,231–140,445
2012	ND	1,581,555	ND	374,523	ND	30,462–89,957
2013	ND	1,359,893	ND	489,654	ND	70,781–212,705
2014	ND	1,520,340 ^e	ND	440,192	ND	55,759–137,256

Note: Bendix counts were converted to DIDSON estimates (equivalents) for Kenai (1979–2006) and Kasilof rivers (1983–2007).

Estimates after these dates are actual DIDSON generated estimates.

^a Counting began on 22 June from 1978 to 1987, and on 1 July from 1988 to present.

^b Includes counts or estimates prior to 15 June (1978–1988) and post enumeration estimates (1981–1986).

^c The escapement range (2009–2012) was based on DIDSON estimates and 1 of 7 possible fish wheel catch scenarios.

^d Combined counts from weirs on Bear and Glacier Flat creeks and surveys of remaining spawning streams.

^e Reflects a postseason adjustment related to apportionments.

Table 3.—Daily salmon escapement estimates in the Kenai River, 1 July–14 August 2014.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	10,392	10,392	0	0	0	0	0	0
2 Jul	9,240	19,632	0	0	0	0	0	0
3 Jul	10,794	30,426	0	0	0	0	0	0
4 Jul	9,288	39,714	0	0	0	0	0	0
5 Jul	11,574	51,288	0	0	0	0	0	0
6 Jul	29,490	80,778	0	0	0	0	0	0
7 Jul	29,075	109,853	0	0	0	0	0	0
8 Jul	16,872	126,725	0	0	0	0	0	0
9 Jul	24,197	150,922	0	0	0	0	0	0
10 Jul	20,312	171,234	0	0	0	0	0	0
11 Jul	12,606	183,840	0	0	0	0	0	0
12 Jul	23,624	207,464	0	0	0	0	0	0
13 Jul	31,889	239,353	0	0	0	0	0	0
14 Jul	23,196	262,549	0	0	0	0	0	0
15 Jul	23,863	286,412	0	0	0	0	0	0
16 Jul	20,934	307,346	0	0	0	0	0	0
17 Jul	32,388	339,734	0	0	0	0	0	0
18 Jul	39,042	378,776	0	0	0	0	0	0
19 Jul	16,536	395,313	0	0	0	0	0	0
20 Jul	34,104	429,417	0	0	0	0	0	0
21 Jul	63,930	493,347	0	0	0	0	0	0
22 Jul	44,232	537,579	0	0	0	0	0	0
23 Jul	37,486	575,065	0	0	0	0	0	0
24 Jul	37,955	613,020	0	0	0	0	0	0
25 Jul	29,844	642,864	0	0	0	0	0	0
26 Jul	32,013	674,877	0	0	0	0	0	0
27 Jul	22,073	696,950	0	0	0	0	0	0
28 Jul	31,578	728,528	0	0	0	0	0	0
29 Jul	38,313	766,841	0	0	0	0	0	0
30 Jul	58,003	824,844	0	0	0	0	0	0
31 Jul	66,780	891,624	0	0	0	0	0	0
1 Aug	34,951	926,575	12,101	12,101	0	0	907	907
2 Aug	33,506	960,080	10,398	22,499	757	757	0	907
3 Aug	50,172	1,010,252	8,245	30,744	934	1,691	1,031	1,938
4 Aug	54,898	1,065,150	15,113	45,857	3,684	5,376	1,702	3,640
5 Aug	111,807	1,176,957	45,473	91,330	173	5,549	520	4,160
6 Aug	63,596	1,240,553	91,303	182,633	2,812	8,361	2,348	6,508
7 Aug	58,099	1,298,652	73,442	256,075	2,609	10,970	196	6,705
8 Aug	55,069	1,353,720	31,799	287,874	990	11,960	331	7,035
9 Aug	53,343	1,407,063	144,921	432,795	310	12,270	498	7,533
10 Aug	58,081	1,465,145	82,011	514,806	1,157	13,427	767	8,300
11 Aug	30,429	1,495,574	34,224	549,030	3,513	16,940	1,301	9,601
12 Aug	14,234	1,509,808	29,929	578,959	2,585	19,525	957	10,558
13 Aug	4,484	1,514,292	35,852	614,811	4,932	24,458	137	10,694
14 Aug	6,048	1,520,340	44,550	659,361	2,268	26,726	1,521	12,215

Sockeye salmon 95% CI 1,494,105–1,546,575

Note: Pink, coho, and Chinook salmon estimates are not indicative of run strength.

Table 4.—Pink salmon escapement estimates (Bendix and DIDSON) for the Kenai River 1980–2014.

Year	Kenai R. ^a		
	Bendix	DIDSON	Apportionment start
1980	262,394	377,420	
1981	14,344	20,263	
1982	3,647	4,761	
1983	0	0	
1984	13,541	18,921	
1985	3,344	4,528	
1986	4,381	5,646	
1987	3,483	4,898	
1988	8,761	11,638	
1989	24,985	35,848	
1990	4,224	6,087	
1991	2,551	3,761	
1992	22,541	32,399	
1993	2,867	3,999	
1994	0	0	
1995	0	0	
1996	0	0	
1997	255	362	
1998	10,585	14,963	8/3/1998
1999	0	0	no apportionment
2000	4,366	6,296	8/2/2000
2001	2,179	3,038	8/8/2001
2002	39,301	54,963	8/6/2002
2003	0	0	no apportionment
2004	117,561	165,010	8/7/2004
2005	0	0	8/18/2005
2006	351,953	484,558	8/8/2006
2007	0	0	8/16/2007
2008	199,223	297,124	8/2/2008
2009	17,765	25,987	7/19/2009
2010	18,876	25,957	8/7/2010
2011	ND	0	no apportionment
2012	ND	24,712	8/11/2012
2013	ND	2,350	8/2/2013
2014	ND	659,361	8/1/2014
Average apportionment date			8/5
Average even year apportionment date			8/5
Average odd year apportionment date			8/6

Note: Pink salmon estimates do not encompass the entire pink salmon run since sonar is operated to match sockeye salmon run timing. Bendix counts were converted to DIDSON estimates (equivalents) for Kenai (1979–2006). Estimates after these dates are actual DIDSON generated estimates.

^a Counting began on 22 June from 1978 to 1987, and on 1 July from 1988 to present.

Table 5.—Cumulative proportion by date of sockeye salmon escapement in the Kenai River, 1999–2014.

Date	Cumulative proportion															
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
01 Jul	0.001	0.003	0.002	0.005	0.005	0.002	0.004	0.001	0.004	0.004	0.003	0.004	0.001	0.003	0.006	0.007
02 Jul	0.002	0.005	0.011	0.013	0.008	0.005	0.010	0.003	0.010	0.009	0.008	0.008	0.004	0.008	0.009	0.013
03 Jul	0.003	0.010	0.017	0.018	0.012	0.007	0.015	0.004	0.015	0.014	0.013	0.011	0.006	0.013	0.012	0.020
04 Jul	0.004	0.015	0.023	0.028	0.017	0.009	0.023	0.006	0.018	0.016	0.020	0.017	0.007	0.016	0.020	0.026
05 Jul	0.005	0.018	0.029	0.057	0.022	0.010	0.033	0.008	0.021	0.018	0.027	0.027	0.010	0.019	0.028	0.034
06 Jul	0.007	0.021	0.033	0.085	0.024	0.011	0.042	0.010	0.025	0.019	0.033	0.038	0.013	0.021	0.032	0.053
07 Jul	0.010	0.028	0.038	0.142	0.028	0.014	0.049	0.012	0.031	0.021	0.041	0.043	0.016	0.024	0.034	0.072
08 Jul	0.015	0.034	0.047	0.181	0.031	0.018	0.058	0.014	0.041	0.022	0.047	0.051	0.019	0.027	0.037	0.083
09 Jul	0.020	0.045	0.056	0.207	0.037	0.020	0.078	0.016	0.051	0.026	0.055	0.057	0.023	0.031	0.042	0.099
10 Jul	0.025	0.059	0.063	0.227	0.046	0.022	0.095	0.019	0.055	0.031	0.062	0.062	0.028	0.036	0.055	0.113
11 Jul	0.027	0.066	0.071	0.239	0.066	0.024	0.121	0.021	0.061	0.034	0.073	0.070	0.030	0.043	0.080	0.121
12 Jul	0.030	0.073	0.075	0.247	0.118	0.026	0.158	0.022	0.066	0.037	0.101	0.085	0.032	0.049	0.088	0.136
13 Jul	0.032	0.113	0.081	0.255	0.154	0.030	0.177	0.024	0.070	0.045	0.117	0.109	0.034	0.056	0.094	0.157
14 Jul	0.037	0.260	0.097	0.265	0.178	0.113	0.189	0.025	0.075	0.049	0.146	0.126	0.038	0.069	0.112	0.173
15 Jul	0.047	0.390	0.141	0.291	0.197	0.215	0.199	0.027	0.083	0.092	0.212	0.150	0.040	0.144	0.181	0.188
16 Jul	0.051	0.464	0.188	0.328	0.273	0.284	0.231	0.036	0.091	0.204	0.288	0.199	0.057	0.268	0.362	0.202
17 Jul	0.064	0.501	0.250	0.356	0.363	0.320	0.276	0.046	0.097	0.288	0.358	0.265	0.202	0.314	0.521	0.223
18 Jul	0.095	0.552	0.295	0.400	0.441	0.344	0.313	0.052	0.108	0.318	0.407	0.336	0.312	0.334	0.608	0.249
19 Jul	0.137	0.591	0.347	0.500	0.501	0.359	0.367	0.056	0.156	0.347	0.442	0.422	0.367	0.352	0.676	0.260
20 Jul	0.163	0.611	0.388	0.565	0.529	0.366	0.394	0.061	0.174	0.396	0.503	0.480	0.438	0.378	0.736	0.282
21 Jul	0.198	0.631	0.410	0.600	0.556	0.389	0.409	0.071	0.210	0.449	0.540	0.530	0.495	0.440	0.764	0.324
22 Jul	0.248	0.650	0.434	0.625	0.614	0.458	0.427	0.093	0.263	0.501	0.552	0.570	0.518	0.510	0.782	0.354
23 Jul	0.307	0.680	0.467	0.653	0.669	0.479	0.465	0.117	0.308	0.518	0.567	0.605	0.585	0.566	0.804	0.378
24 Jul	0.359	0.721	0.525	0.680	0.716	0.503	0.506	0.146	0.347	0.537	0.588	0.622	0.654	0.598	0.817	0.403
25 Jul	0.447	0.759	0.600	0.706	0.742	0.528	0.527	0.181	0.386	0.555	0.599	0.664	0.704	0.637	0.827	0.423
26 Jul	0.517	0.794	0.678	0.740	0.768	0.558	0.541	0.238	0.441	0.567	0.613	0.682	0.753	0.676	0.843	0.444
27 Jul	0.592	0.822	0.731	0.752	0.789	0.584	0.549	0.277	0.512	0.595	0.662	0.700	0.798	0.717	0.865	0.458
28 Jul	0.650	0.847	0.760	0.764	0.823	0.614	0.556	0.317	0.562	0.626	0.715	0.721	0.833	0.757	0.886	0.479
29 Jul	0.689	0.872	0.784	0.777	0.847	0.640	0.565	0.362	0.598	0.662	0.758	0.736	0.856	0.802	0.907	0.504
30 Jul	0.717	0.886	0.812	0.788	0.862	0.658	0.588	0.402	0.621	0.704	0.794	0.750	0.875	0.829	0.925	0.543
31 Jul	0.736	0.897	0.834	0.802	0.877	0.672	0.615	0.435	0.644	0.736	0.830	0.762	0.886	0.855	0.938	0.586
01 Aug	0.759	0.908	0.856	0.815	0.894	0.682	0.633	0.475	0.667	0.772	0.854	0.777	0.900	0.871	0.955	0.609
02 Aug	0.783	0.916	0.879	0.829	0.913	0.695	0.644	0.508	0.684	0.800	0.882	0.801	0.913	0.887	0.968	0.631

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Table 5.—Page 2 of 2.

Date	Cumulative proportion																
	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	
03 Aug	0.800	0.930	0.896	0.845	0.930	0.724	0.660	0.535	0.694	0.821	0.911	0.841	0.919	0.898	0.976	0.664	
04 Aug	0.817	0.945	0.916	0.861	0.943	0.756	0.673	0.565	0.708	0.844	0.930	0.856	0.926	0.909	0.982	0.701	
05 Aug	0.832	0.958	0.929	0.879	0.951	0.777	0.684	0.596	0.729	0.863	0.946	0.867	0.933	0.923	0.989	0.774	
06 Aug	0.848	0.969	0.943	0.894	0.966	0.796	0.711	0.616	0.755	0.880	0.955	0.879	0.946	0.932	0.995	0.816	
07 Aug	0.872	0.978	0.958	0.910	0.977	0.811	0.735	0.631	0.773	0.893	0.962	0.892	0.957	0.939	1.000	0.854	
08 Aug	0.895	0.985	0.972	0.929	0.985	0.819	0.745	0.640	0.788	0.903	0.967	0.904	0.961	0.945	—	0.890	
09 Aug	0.914	0.992	0.979	0.953	0.992	0.840	0.753	0.649	0.816	0.915	0.973	0.917	0.969	0.952	—	0.925	
10 Aug	0.923	1.000	0.986	0.972	1.000	0.873	0.760	0.656	0.832	0.931	0.982	0.928	0.979	0.961	—	0.964	
11 Aug	0.932	—	0.989	0.985	—	0.904	0.771	0.665	0.857	0.947	0.987	0.934	0.986	0.967	—	0.984	
12 Aug	0.945	—	0.998	0.991	—	0.936	0.809	0.681	0.882	0.963	0.992	0.940	0.994	0.974	—	0.993	
13 Aug	0.953	—	1.000	0.996	—	0.957	0.853	0.695	0.898	0.974	1.000	0.949	1.000	0.979	—	0.996	
14 Aug	0.963	—	—	1.000	—	0.971	0.881	0.708	0.910	0.987	—	0.959	—	0.987	—	1.000	
15 Aug	0.977	—	—	—	—	0.982	0.912	0.729	0.922	0.995	—	0.973	—	0.996	—	—	
16 Aug	0.985	—	—	—	—	0.988	0.942	0.752	0.933	0.998	—	0.986	—	1.000	—	—	
17 Aug	0.993	—	—	—	—	0.996	0.962	0.773	0.944	1.000	—	0.992	—	—	—	—	
18 Aug	1.000	—	—	—	—	1.000	0.974	0.795	0.953	—	—	0.997	—	—	—	—	
19 Aug	—	—	—	—	—	—	0.980	0.819	0.966	—	—	1.000	—	—	—	—	
21 Aug	—	—	—	—	—	—	0.991	0.844	0.978	—	—	—	—	—	—	—	
21 Aug	—	—	—	—	—	—	—	1.000	0.860	0.985	—	—	—	—	—	—	—
22 Aug	—	—	—	—	—	—	—	0.882	0.993	—	—	—	—	—	—	—	—
23 Aug	—	—	—	—	—	—	—	0.901	1.000	—	—	—	—	—	—	—	—
24 Aug	—	—	—	—	—	—	—	0.915	—	—	—	—	—	—	—	—	—
25 Aug	—	—	—	—	—	—	—	0.929	—	—	—	—	—	—	—	—	—
26 Aug	—	—	—	—	—	—	—	0.944	—	—	—	—	—	—	—	—	—
27 Aug	—	—	—	—	—	—	—	0.963	—	—	—	—	—	—	—	—	—
28 Aug	—	—	—	—	—	—	—	0.979	—	—	—	—	—	—	—	—	—
29 Aug	—	—	—	—	—	—	—	0.989	—	—	—	—	—	—	—	—	—
30 Aug	—	—	—	—	—	—	—	0.996	—	—	—	—	—	—	—	—	—
31 Aug	—	—	—	—	—	—	—	—	1.000	—	—	—	—	—	—	—	—
Run midpoint	26 Jul	17 Jul	24 Jul	19 Jul	19 Jul	24 Jul	24 Jul	2 Aug	27 Jul	22 Jul	20 Jul	21 Jul	22 Jul	22 Jul	17 Jul	29 Jul	
Midpoint ave:	23 Jul																
Counting days	49	41	44	45	41	49	52	62	54	48	44	50	44	47	38	45	
Ave days: 47																	
Number of days in which 80% of escapement occurred																	
Ave: 25	22	20	21	32	22	29	36	32	28	24	22	27	16	21	16	30	

Table 6.—Distribution of sockeye salmon passage by bank (% of total count) in the Kenai, Kasilof and Yentna rivers, 1979–2014.

Year	Kenai River		Kasilof River		Yentna River	
	North	South	North	South	North	South
1979	72	28	53	47	ND	ND
1980	61	39	52	48	ND	ND
1981	72	28	69	31	ND	ND
1982	39	61	73	27	ND	ND
1983	42	58	51	49	ND	ND
1984	65	35	56	44	ND	ND
1985	54	46	70	30	9	91
1986	62	38	57	43	32	68
1987	48	52	55	45	10	90
1988	47	53	32	68	8	92
1989	57	43	39	61	12	88
1990	62	38	29	71	2	98
1991	73	27	39	61	8	92
1992	60	40	45	55	5	95
1993	49	51	28	72	14	86
1994	52	48	47	53	8	92
1995	52	48	38	62	11	89
1996	54	46	61	39	21	79
1997	56	44	41	59	11	89
1998	55	45	36	64	49	51
1999	55	45	51	49	26	74
2000	64	36	51	49	22	78
2001	50	50	63	37	38	63
2002	49	51	48	52	25	75
2003	49	51	50	50	29	71
2004	49	51	43	57	6	94
2005	45	55	59	41	17	83
2006	41	59	67	33	11	89
2007	50	50	75	25	16	84
2008	48	52	73	27	15	85
2009	47	53	74	26	16–19	81–83
2010	51	49	70	30	17–20	80–82
2011	52	48	71	29	16–22	78–84
2012	58	42	66	34	23–31	68–77
2013	53	47	64	36	10–15	85–88
2014	45	55	62	38	9–13	88–90
Ave (1979–2013)	51	49	58	42	21	79

Note: The Yentna River escapement range (2009–2014) was based on DIDSON estimates and 1 of 7 possible fish wheel catch scenarios. North and south bank escapement range estimates provide the total escapement range and also provide the salmon passage distribution by bank.

Table 7.—Nearshore (<10 m) and offshore (>10 m) distribution of fish from both banks of the Kenai, Kasilof and Yentna rivers based on stratified (weekly) DIDSON subsample counts, 2014.

North Bank												
Dates	Kenai River				Kasilof River				Yentna River			
	1–10 m	%	10–30 m	%	1–10 m	%	10–30 m	%	1–10 m	%	10–30 m	%
15 Jun–21 Jun	ND	ND	ND	ND	4,323	89.2	523	10.8	ND	ND	ND	ND
22 Jun–28 Jun	ND	ND	ND	ND	3,980	93.3	287	6.7	ND	ND	ND	ND
29 Jun–5 Jul	565	10.1	5,054	89.9	3,089	92.8	239	7.2	ND	ND	ND	ND
6 Jul–12 Jul	7,786	53.2	6,858	46.8	6,666	97.8	150	2.2	221	85.7	37	14.3
13 Jul–19 Jul	14,688	76.5	4,515	23.5	11,531	99.5	60	0.5	2,525	89.4	300	10.6
20 Jul–26 Jul	16,628	61.2	10,558	38.8	8,150	99.2	68	0.8	4,322	84.8	772	15.2
27 Jul–2 Aug	10,400	48.4	11,106	51.6	5,570	99.2	43	0.8	2,234	74.5	765	25.5
3 Aug–9 Aug	38,038	82.4	8,110	17.6	3,035	100.0	0	0.0	1,084	74.0	380	26.0
10 Aug–14 Aug	18,007	98.2	339	1.8	ND	ND	ND	ND	ND	ND	ND	ND
Total	106,112	69.5	46,540	30.5	46,344	97.1	1,370	2.9	10,386	82.2	2,254	17.8
SD		26.1		26.1		5.2		5.2		8.7		8.1
Min		6.2		0.8		81.1		0.0		69.0		0.0
Max		99.2		93.8		100.0		18.9		100.0		31.0
South Bank												
	1–10 m	%	10–20 m	%	1–10 m	%	10–30 m	%	1–10 m	%	10–20 m	%
15 Jun–21 Jun	ND	ND	ND	ND	5,967	72.9	2,223	27.1	ND	ND	ND	ND
22 Jun–28 Jun	ND	ND	ND	ND	4,142	76.1	1,303	23.9	ND	ND	ND	ND
29 Jun–5 Jul	2,392	81.7	537	18.3	2,149	75.7	689	24.3	ND	ND	ND	ND
6 Jul–12 Jul	10,295	91.2	990	8.8	3,563	93.2	258	6.8	952	96.8	31	3.2
13 Jul–19 Jul	11,704	96.8	382	3.2	2,509	97.8	57	2.2	9,673	94.8	529	5.2
20 Jul–26 Jul	18,970	97.9	401	2.1	2,513	97.6	61	2.4	13,089	91.6	1,194	8.4
27 Jul–2 Aug	28,741	96.0	1,190	4.0	1,624	98.7	21	1.3	6,404	81.4	1,462	18.6
3 Aug–9 Aug	95,675	96.7	3,295	3.3	1,193	100.0	0	0.0	3,374	83.2	679	16.8
10 Aug–14 Aug	40,402	98.0	830	2.0	ND	ND	ND	ND	ND	ND	ND	ND
Total	208,179	96.5	7,625	3.5	23,660	83.7	4,612	16.3	33,492	89.6	3,895	10.4
SD		5.3		5.3		14.5		14.5		6.6		6.6
Min		75.6		1.3		52.2		0.0		79.5		1.1
Max		98.7		24.4		100.0		47.8		98.9		20.5

Note: Standard deviation, minimum and maximum percentages were derived from daily counts.

Table 8.—Daily fish wheel catch by salmon species for the Kenai River, 1 July–14 August 2014.

Date	Hours run	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	25.0	33	33	0	0	0	0	0	0	0	0
2 Jul	19.5	28	61	0	0	0	0	0	0	0	0
3 Jul	17.5	25	86	0	0	0	0	0	0	0	0
4 Jul	19.3	13	99	0	0	0	0	0	0	0	0
5 Jul	27.3	6	105	0	0	0	0	0	0	0	0
6 Jul	13.0	36	141	0	0	0	0	0	0	0	0
7 Jul	7.7	33	174	0	0	0	0	0	0	0	0
8 Jul	14.3	7	181	0	0	0	0	0	0	0	0
9 Jul	9.5	38	219	0	0	0	0	0	0	0	0
10 Jul	13.0	58	277	0	0	0	0	0	0	0	0
11 Jul	15.8	4	281	0	0	0	0	0	0	0	0
12 Jul	9.0	45	326	0	0	0	0	0	0	2	2
13 Jul	3.7	25	351	0	0	0	0	0	0	0	2
14 Jul	5.8	231	582	0	0	0	0	0	0	0	2
15 Jul	4.3	17	599	0	0	0	0	0	0	0	2
16 Jul	18.8	7	606	0	0	0	0	0	0	0	2
17 Jul	14.6	32	638	0	0	0	0	0	0	0	2
18 Jul	8.5	52	690	0	0	0	0	0	0	0	2
19 Jul	16.3	34	724	0	0	0	0	0	0	0	2
20 Jul	15.7	18	742	0	0	0	0	0	0	0	2
21 Jul	19.6	57	799	0	0	0	0	0	0	0	2
22 Jul	10.4	44	843	1	1	0	0	0	0	0	2
23 Jul	20.2	43	886	1	2	0	0	0	0	1	3
24 Jul	16.2	71	957	3	5	0	0	0	0	0	3
25 Jul	13.5	33	990	2	7	0	0	0	0	0	3
26 Jul	20.6	45	1,035	1	8	0	0	0	0	0	3
27 Jul	14.8	27	1,062	4	12	0	0	0	0	0	3
28 Jul	11.8	107	1,169	6	18	0	0	0	0	0	3
29 Jul	17.1	37	1,206	7	25	0	0	0	0	1	4
30 Jul	12.8	69	1,275	2	27	0	0	0	0	0	4
31 Jul	20.8	69	1,344	9	36	0	0	1	1	0	4
1 Aug	13.3	58	1,402	7	43	0	0	0	1	1	5
2 Aug	14.7	54	1,456	6	49	0	0	1	2	0	5
3 Aug	10.0	62	1,518	3	52	0	0	1	3	1	6
4 Aug	11.9	43	1,561	7	59	0	0	3	6	1	7
5 Aug	7.2	56	1,617	21	80	0	0	0	6	0	7
6 Aug	17.7	85	1,702	117	197	0	0	3	9	3	10
7 Aug	19.3	119	1,821	140	337	0	0	5	14	0	10
8 Aug	11.4	443	2,264	215	552	1	1	8	22	1	11
9 Aug	6.8	171	2,435	473	1,025	0	1	1	23	0	11
10 Aug	1.8	206	2,641	283	1,308	0	1	4	27	2	13
11 Aug	6.3	96	2,737	104	1,412	0	1	11	38	4	17
12 Aug	8.3	22	2,759	45	1,457	0	1	4	42	1	18
13 Aug	11.7	10	2,769	78	1,535	0	1	11	53	0	18
14 Aug	11.5	8	2,777	58	1,593	0	1	3	56	2	20
Total	607.9	62.4%		35.8%		0.02%		1.3%		0.4%	
Total salmon	4,447										
CPUE:	7.3 fish/h										

Note: Other fish include 35 rainbow trout and 70 Dolly Varden. CPUE is catch per unit effort.

Table 9.—Summary of fish wheel catch and CPUE for the north bank fish wheel at RM 19 on the Kenai River, 1978–2014.

Year	Total hours	Actual north bank fish wheel catch (salmon only)								Total catch	CPUE by species				Total CPUE
		Sockeye	%	Pink	%	Coho	%	Chinook	%		Sockeye	Pink	Coho	Chinook	
1978	853.9	1,445	87.3	207	12.5	4	0.2	0	0.0	1,656	1.7	0.2	0.0	0.0	1.9
1979	301.0	151	84.8	10	5.6	13	7.3	4	2.2	178	0.5	0.0	0.0	0.0	0.6
1980	967.3	464	29.4	1,103	69.8	12	0.8	1	0.1	1,580	0.5	1.1	0.0	0.0	1.6
1981	1,210.8	496	95.0	21	4.0	3	0.6	2	0.4	522	0.4	0.0	0.0	0.0	0.4
1982	433.5	1,200	99.5	2	0.2	2	0.2	2	0.2	1,206	2.8	0.0	0.0	0.0	2.8
1983	448.0	1,678	99.8	0	0.0	3	0.2	0	0.0	1,681	3.7	0.0	0.0	0.0	3.8
1984	962.4	5,854	98.3	64	1.1	36	0.6	3	0.1	5,957	6.1	0.1	0.0	0.0	6.2
1985	394.8	3,294	98.2	37	1.1	17	0.5	7	0.2	3,355	8.3	0.1	0.0	0.0	8.5
1986	408.5	797	97.8	6	0.7	9	1.1	3	0.4	815	2.0	0.0	0.0	0.0	2.0
1987	493.1	4,795	98.1	18	0.4	59	1.2	17	0.3	4,889	9.7	0.0	0.1	0.0	9.9
1988	528.4	4,393	97.5	73	1.6	18	0.4	21	0.5	4,505	8.3	0.1	0.0	0.0	8.5
1989	357.0	6,341	98.2	69	1.1	28	0.4	16	0.2	6,454	17.8	0.2	0.1	0.0	18.1
1990	363.6	4,270	97.8	46	1.1	24	0.5	26	0.6	4,366	11.7	0.1	0.1	0.1	12.0
1991	393.0	6,732	98.6	49	0.7	25	0.4	19	0.3	6,825	17.1	0.1	0.1	0.0	17.4
1992	392.5	5,526	94.0	224	3.8	96	1.6	33	0.6	5,879	14.1	0.6	0.2	0.1	15.0
1993	515.2	4,631	99.2	16	0.3	10	0.2	10	0.2	4,667	9.0	0.0	0.0	0.0	9.1
1994	673.9	5,600	93.6	290	4.8	65	1.1	29	0.5	5,984	8.3	0.4	0.1	0.0	8.9
1995	799.4	3,022	98.5	14	0.5	10	0.3	22	0.7	3,068	3.8	0.0	0.0	0.0	3.8
1996	376.5	3,835	91.2	264	6.3	82	2.0	22	0.5	4,203	10.2	0.7	0.2	0.1	11.2
1997	553.8	8,886	96.6	21	0.2	266	2.9	30	0.3	9,203	16.0	0.0	0.5	0.1	16.6
1998	350.5	7,755	96.2	173	2.1	99	1.2	34	0.4	8,061	22.1	0.5	0.3	0.1	23.0
1999	400.8	4,600	95.9	108	2.3	56	1.2	33	0.7	4,797	11.5	0.3	0.1	0.1	12.0
2000	499.0	3,020	88.5	205	6.0	146	4.3	40	1.2	3,411	6.1	0.4	0.3	0.1	6.8
2001	446.7	3,309	96.8	36	1.1	30	0.9	45	1.3	3,420	7.4	0.1	0.1	0.1	7.7
2002	610.5	4,073	88.4	461	10.0	54	1.2	18	0.4	4,606	6.7	0.8	0.1	0.0	7.5
2003	317.1	2,749	98.0	20	0.7	12	0.4	25	0.9	2,806	8.7	0.1	0.0	0.1	8.8
2004	461.7	3,299	75.0	843	19.2	225	5.1	31	0.7	4,398	7.1	1.8	0.5	0.1	9.5
2005	184.9	3,140	97.8	27	0.8	28	0.9	16	0.5	3,211	17.0	0.1	0.2	0.1	17.4
2006	635.0	12,285	86.0	1,413	9.9	485	3.4	101	0.7	14,284	19.3	2.2	0.8	0.2	22.5
2007	933.5	6,243	98.1	16	0.3	76	1.2	27	0.4	6,362	6.7	0.0	0.1	0.0	6.8
2008	862.4	5,250	89.9	489	8.4	80	1.4	18	0.3	5,837	6.1	0.6	0.1	0.0	6.8
2009	427.2	1,435	93.9	76	5.0	10	0.7	7	0.5	1,528	3.4	0.2	0.0	0.0	3.6

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Table 9.—Page 2 of 2.

Year	Total hours	Sockeye	%	Pink	%	Coho	%	Chinook	%	Total catch	CPUE by species				Total CPUE
											Sockeye	Pink	Coho	Chinook	
2011	601.2	1,999	99.0	11	0.5	2	0.1	7	0.3	2,019	3.3	0.0	0.0	0.0	3.4
2012	704.6	1,797	94.1	82	4.3	10	0.5	21	1.1	1,910	2.6	0.1	0.0	0.0	2.7
2013	529.3	1,732	95.8	36	2.0	24	1.3	16	0.9	1,808	3.3	0.1	0.0	0.0	3.4
2014	607.9	2,777	62.5	1,593	35.8	56	1.3	20	0.4	4,446	4.6	2.6	0.1	0.0	7.3

Year	Ave. hours	Average catch						Total	Average CPUE by species				Total		
		Sockeye	%	Pink	%	Coho	%	Chinook	%	Sockeye	Pink	Coho	Chinook		
Odd	517.0	3,624	97.7	33	0.9	37	1.0	17	0.5	3,711	7.0	0.1	0.1	0.0	7.2
Even	601.4	4,048	90.1	338	7.5	84	1.9	24	0.5	4,493	6.7	0.6	0.1	0.0	7.5
Ave (%): (1978–2013)		93.5		4.5		1.5		0.5			6.9	0.3	0.1	0.0	7.3
Min (%): (1978–2013)		29.4		0.0		0.1		0.0			0.4	0.0	0.0	0.0	0.4
Max (%): (1978–2013)		99.8		69.8		7.3		2.2			22.1	2.2	0.8	0.2	23.0
SD (%): (1978–2013)		12.1		11.8		1.5		0.4			5.8	0.5	0.2	0.0	6.1

Note: CPUE is catch per unit effort.

Table 10.—Age composition of sockeye salmon sampled from the Kenai River fish wheel, 1970–2014.

Year	Percentage composition by age class								Sample size
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	Other	
1970	0.0	10.0	17.0	0.0	26.0	25.0	15.0	6.0	225
1971	0.0	8.0	39.0	1.0	3.0	38.0	11.0	0.0	168
1972	0.0	21.0	34.0	0.0	0.0	23.0	20.0	0.0	403
1973	0.0	5.0	68.0	1.0	1.0	8.0	16.0	0.0	632
1974	2.0	18.0	46.0	0.0	3.0	18.0	12.0	0.0	295
1975	2.0	10.0	36.0	2.0	4.0	31.0	14.0	1.0	162
1976	1.0	46.0	20.0	0.0	2.0	22.0	8.0	1.0	948
1977	0.0	6.0	76.0	1.0	0.0	7.0	10.0	0.0	1,265
1978	0.0	2.5	86.7	0.0	0.0	4.9	5.4	0.0	811
1979	0.2	19.6	63.0	0.0	0.0	10.6	6.6	0.0	601
1980	6.1	35.4	36.7	0.0	0.9	14.4	6.5	0.0	557
1981	0.0	19.7	66.4	0.0	0.5	7.9	5.3	0.2	624
1982	0.1	5.8	87.5	0.0	0.0	2.9	3.7	0.0	1,787
1983	0.3	8.4	79.0	0.3	0.5	2.2	8.9	0.4	1,765
1984	0.0	23.1	37.8	3.6	0.5	13.2	19.5	2.3	2,067
1985	0.1	15.9	56.4	0.3	0.1	14.7	11.4	1.1	2,201
1986	0.0	31.8	39.5	0.7	0.3	8.2	18.0	1.5	789
1987	0.0	12.8	78.4	0.1	0.0	3.2	5.2	0.3	745
1988	0.3	11.6	74.2	0.4	0.2	3.1	10.2	0.0	1,420
1989	0.2	5.6	26.7	0.9	0.8	7.6	57.4	0.8	1,587
1990	0.6	21.6	41.4	0.6	0.3	13.7	21.1	0.7	1,513
1991	0.1	48.2	31.6	0.2	0.4	5.7	11.4	2.4	2,502
1992	0.0	2.7	79.9	0.2	0.3	5.9	11.0	0.0	1,338
1993	0.3	12.2	30.5	2.6	6.3	6.4	41.2	0.5	2,088
1994	0.3	6.6	61.1	0.8	0.8	17.8	12.1	0.5	1,341
1995	0.3	31.9	26.4	0.4	2.4	6.6	31.3	0.7	712
1996	0.0	10.8	75.4	0.3	0.7	6.1	5.4	1.3	684
1997	0.1	7.6	75.2	0.4	0.4	2.8	13.0	0.5	963
1998	0.3	27.1	40.7	1.3	6.6	9.6	13.9	0.5	700
1999	0.0	15.1	55.4	0.4	1.2	16.8	9.6	1.5	733
2000	0.0	15.3	55.1	1.0	2.6	9.4	14.5	2.1	560
2001	0.3	10.8	68.9	0.8	1.5	8.3	9.2	0.2	601
2002	0.0	23.0	58.4	0.7	0.7	10.6	6.1	0.5	2,441
2003	0.0	14.4	57.9	0.4	0.1	8.0	18.7	0.5	1,555
2004	0.0	10.1	69.1	0.2	0.2	8.2	11.1	1.1	1,275
2005	0.0	2.8	81.3	0.3	0.2	2.8	11.8	0.8	1,893
2006	0.0	9.9	38.7	2.4	0.4	3.7	44.0	0.9	1,315
2007	0.0	5.9	78.8	1.5	0.7	4.4	7.8	0.9	759
2008	0.0	15.2	60.9	4.6	0.7	7.2	10.9	0.5	567
2009	0.3	6.1	72.6	0.9	0.1	9.8	9.7	0.4	701
2010	0.2	23.4	44.4	0.2	2.8	4.7	23.9	0.4	855
2011	0.1	8.0	38.9	0.4	1.1	5.4	45.6	0.4	791
2012	0.5	12.4	45.1	1.7	0.2	15.5	24.6	0.0	419
2013	0.2	12.1	54.8	0.6	0.4	7.2	24.2	0.6	513
2014	0.4	12.3	63.5	0.0	0.8	7.2	15.3	0.6	498
Ave (1970–13)	0.4	15.2	54.8	0.8	1.7	10.5	15.8	0.7	1,043

Note: Ages in European notation.

Table 11.—Average lengths of the major age classes of sockeye salmon sampled from the Kenai River fish wheel, 1982–2014.

Year	Age class	Male		Female		Both		Ratio Male: Female	Age class	Male		Female		Both		Ratio Male: Female
		Length (mm)	n	Length (mm)	n	Length (mm)	n			Length (mm)	n	Length (mm)	n	Length (mm)	n	
1982	1.2	483	70	505	32	490	102	2.2:1	1.3	596	723	572	841	583	1,564	0.9:1
1983		524	25	520	30	522	55	0.8:1		598	215	577	269	586	484	0.8:1
1984		474	280	473	196	474	476	1.4:1		582	385	559	395	571	780	1.0:1
1985		492	184	490	186	491	370	1.0:1		575	496	552	824	560	1,320	0.6:1
1986		488	155	492	96	489	251	1.6:1		584	112	564	200	571	312	0.6:1
1987		513	39	502	56	507	95	0.7:1		604	183	586	401	591	584	0.5:1
1988		521	79	511	84	516	163	0.9:1		598	428	572	624	583	1,052	0.7:1
1989		464	51	463	40	463	91	1.3:1		592	213	565	218	578	431	1.0:1
1990		474	168	478	127	476	295	1.3:1		586	358	559	318	574	676	1.1:1
1991		488	613	497	577	492	1,190	1.1:1		561	357	539	441	549	798	0.8:1
1992		480	13	462	25	468	38	0.5:1		573	370	549	714	557	1,084	0.5:1
1993		474	123	481	132	477	255	0.9:1		583	247	556	390	566	637	0.6:1
1994		452	46	462	42	457	88	1.1:1		579	367	552	452	564	819	0.8:1
1995		492	116	487	111	489	227	1.0:1		584	81	564	107	572	188	0.8:1
1996		507	47	519	27	511	74	1.7:1		607	243	589	273	597	516	0.9:1
1997		480	34	489	39	485	73	0.9:1		593	372	571	352	582	724	1.1:1
1998		483	95	494	95	488	190	1.0:1		577	146	547	139	562	285	1.1:1
1999		490	72	488	39	490	111	1.8:1		600	202	576	204	588	406	1.0:1
2000		513	47	513	43	513	90	1.1:1		605	159	584	165	594	324	1.0:1
2001		522	35	507	30	515	65	1.2:1		596	196	577	218	586	414	0.9:1
2002		503	306	502	256	503	562	1.2:1		606	665	580	760	592	1,425	0.9:1
2003		483	116	466	117	474	233	1.0:1		593	387	574	504	582	891	0.8:1
2004		497	64	482	65	489	129	1.0:1		585	396	569	485	576	881	0.8:1
2005		483	27	495	30	490	57	0.9:1		588	649	564	883	574	1,532	0.7:1
2006		498	72	497	58	497	130	1.2:1		572	239	553	270	562	509	0.9:1
2007		512	21	499	24	505	45	0.9:1		594	313	567	285	581	598	1.1:1
2008		472	45	465	41	468	86	1.1:1		595	160	576	185	585	345	0.9:1
2009		482	24	492	19	486	43	1.3:1		594	206	578	303	584	509	0.7:1
2010		474	121	493	79	481	200	1.5:1		578	163	568	217	573	380	0.8:1
2011		462	35	479	28	470	63	1.3:1		591	124	568	184	577	308	0.7:1
2012		461	36	474	16	465	52	2.3:1		592	81	569	108	579	189	0.7:1
2013		467	38	472	24	469	62	1.6:1		576	114	559	167	566	281	0.7:1
2014		454	45	464	16	457	61	2.8:1		576	140	552	176	563	316	0.8:1
Ave (1982–2013)		487	100	490	84	488	186	1.2:1		589	292	566	372	576	664	0.8:1

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Table 11.–Page 2 of 2.

Year	Age class	Male			Female			Both			Ratio Male: Female	Age class	Male			Female			Ratio Male: Female
		Length (mm)	n	Length (mm)	n	Length (mm)	n	Length (mm)	n	Length (mm)			Length (mm)	n	Length (mm)	n	Length (mm)	n	
1982	2.2	530	21	522	30	525	51	0.7:1	2.3	598	46	580	21	592	67	2.2:1			
1983		524	25	520	30	522	55	0.8:1		595	26	582	35	587	61	0.7:1			
1984		505	116	508	159	507	275	0.7:1		570	210	557	192	564	402	1.1:1			
1985		513	132	513	196	513	328	0.7:1		570	106	555	129	562	235	0.8:1			
1986		ND	ND	ND	ND	ND	ND			585	52	568	89	575	141	0.6:1			
1987		510	11	517	13	514	24	0.8:1		608	15	583	24	593	39	0.6:1			
1988		527	20	527	24	527	44	0.8:1		596	53	577	92	584	145	0.6:1			
1989		499	47	505	73	503	120	0.6:1		605	402	579	501	591	903	0.8:1			
1990		494	88	496	113	495	201	0.8:1		589	177	568	132	580	309	1.3:1			
1991		497	68	486	89	491	157	0.8:1		572	153	543	139	558	292	1.1:1			
1992		485	31	485	44	485	75	0.7:1		570	46	547	88	555	134	0.5:1			
1993		514	58	519	76	517	134	0.8:1		583	357	560	503	570	860	0.7:1			
1994		481	67	488	171	486	238	0.4:1		578	73	551	89	563	162	0.8:1			
1995		504	23	521	24	513	47	1.0:1		588	114	569	109	578	223	1.0:1			
1996		511	18	520	24	516	42	0.8:1		606	18	598	19	602	37	0.9:1			
1997		489	12	504	15	498	27	0.8:1		600	52	567	73	581	125	0.7:1			
1998		501	28	507	39	504	67	0.7:1		574	48	559	49	566	97	1.0:1			
1999		517	38	512	85	513	123	0.4:1		592	37	574	33	583	70	1.1:1			
2000		519	35	518	20	519	55	1.8:1		603	44	583	41	593	85	1.1:1			
2001		519	14	538	36	533	50	0.4:1		600	26	579	29	588	55	0.9:1			
2002		515	117	513	142	514	259	0.8:1		604	75	579	74	591	149	1.0:1			
2003		514	45	515	73	515	118	0.6:1		594	135	574	163	583	298	0.8:1			
2004		513	34	512	71	512	105	0.5:1		596	71	566	71	581	142	1.0:1			
2005		499	20	508	39	505	59	0.5:1		582	110	561	111	572	221	1.0:1			
2006		521	17	523	31	522	48	0.5:1		577	250	557	329	566	579	0.8:1			
2007		517	11	520	22	519	33	0.5:1		587	26	568	33	576	59	0.8:1			
2008		489	14	504	27	499	41	0.5:1		589	37	572	25	582	62	1.5:1			
2009		506	26	534	43	524	69	0.6:1		591	29	578	39	583	68	0.7:1			
2010		488	27	498	13	491	40	2.1:1		591	75	568	129	576	204	0.6:1			
2011		479	24	518	19	496	43	1.3:1		596	161	572	200	583	361	0.8:1			
2012		496	29	518	36	508	65	0.8:1		594	47	568	56	580	103	0.8:1			
2013		488	20	510	17	498	37	1.2:1		591	43	563	81	573	124	0.5:1			
2014		485	19	497	17	491	36	1.1:1		578	31	555	45	565	76	0.7:1			
Ave (1982–2013)		505	40	509	58	507	98	0.7:1		588	97	566	116	576	213	0.8:1			
2014 (all ages)		543	240	542	258	543	498	0.9:1											

Table 12.—Mean annual water level gain, turbidity (secchi depth), air and water temperature measured at the Kasilof, Kenai and Yentna river sonar sites, 1979–2014.

Year	Kasilof River				Kenai River			
	Water level gain (m)	Secchi disk (cm)	Air °C	Water °C	Water level gain (m)	Secchi disk (cm)	Air °C	Water °C
1979	ND	ND	ND	ND	ND	ND	ND	ND
1980	ND	ND	ND	ND	ND	ND	ND	ND
1981	ND	ND	ND	ND	ND	ND	ND	ND
1982	1.0	ND	12.0	10.2	0.5	ND	14.2	9.3
1983	ND	ND	ND	ND	0.4	ND	ND	12.6
1984	0.6	ND	ND	14.4	0.5	ND	ND	12.5
1985	0.8	ND	ND	13.0	ND	ND	ND	ND
1986	1.3	ND	ND	11.0	ND	ND	ND	ND
1987	ND	ND	ND	ND	0.4	ND	14.7	9.3
1988	ND	ND	ND	ND	0.3	ND	15.8	11.8
1989	1.3	ND	16.6	13.3	0.8	73.9	15.1	6.8
1990	0.8	ND	17.2	15.0	0.5	77.7	15.0	12.6
1991	0.6	ND	15.7	13.3	0.2	89.9	13.4	12.8
1992	0.8	ND	18.0	13.0	0.5	88.9	15.0	12.0
1993	0.9	ND	19.0	16.2	0.7	99.8	16.6	13.0
1994	1.5	ND	17.1	13.2	0.4	87.6	14.3	11.4
1995	0.9	ND	16.0	12.5	0.4	101.6	14.1	11.1
1996	1.0	ND	16.0	13.0	0.8	52.3	13.6	12.1
1997	1.2	ND	19.0	16.0	0.3	66.5	14.0	14.0
1998	0.9	ND	13.6	16.5	0.5	69.1	13.4	12.0
1999	1.0	ND	13.4	14.6	0.4	74.2	13.9	12.5
2000	1.0	ND	11.3	14.6	0.4	77.7	13.3	11.6
2001	0.7	ND	18.6	15.5	0.4	80.0	13.8	12.4
2002	1.1	ND	17.8	9.1	0.3	99.3	15.0	12.6
2003	1.1	ND	17.1	10.4	0.5	58.4	15.1	12.3
2004	1.1	ND	19.9	13.5	0.5	83.3	16.1	14.3
2005	0.9	ND	19.6	14.8	0.2	109.2	14.1	14.2
2006	0.9	ND	16.7	12.5	0.4	107.7	13.0	11.7
2007	1.0	50.4	17.9	14.9	0.4	85.3	13.6	12.5
2008	0.9	ND	16.0	11.3	0.4	92.7	12.5	10.6
2009	1.2	ND	17.0	12.3	1.1	74.1	13.8	12.5
2010	0.9	ND	15.8	12.2	0.4	99.1	13.2	10.2
2011	1.1	ND	17.5	12.8	0.6	86.7	13.8	12.3
2012	0.9	74.3	16.4	11.4	0.3	108.7	13.0	10.4
2013	1.2	51.4	18.7	12.4	0.3	82.6	14.8	11.7
2014	1.1	ND	15.9	12.4	0.8	81.6	14.9	12.2
Summary 1979–2013								
Ave	1.0	ND	16.7	13.2	0.5	85.1	14.2	11.8
Min	0.6	ND	11.3	9.1	0.2	52.3	12.5	6.8
Max	1.5	ND	19.9	16.5	1.1	109.2	16.6	14.3

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Table 12.–Page 2 of 2.

Year	Yentna River			
	Water level gain (m)	Secchi disk (cm)	Air °C	Water °C
1979	ND	ND	ND	ND
1980	ND	ND	ND	ND
1981	ND	ND	ND	ND
1982	ND	ND	ND	ND
1983	ND	ND	ND	ND
1984	ND	ND	ND	ND
1985	0.8	ND	13.9	ND
1986	1.4	ND	12.5	8.9
1987	ND	ND	ND	ND
1988	ND	ND	ND	ND
1989	1.5	ND	12.6	8.7
1990	ND	ND	ND	ND
1991	1.2	ND	8.3	8.6
1992	1.2	ND	9.6	8.1
1993	1.2	ND	13.2	9.8
1994	0.8	ND	11.7	9.1
1995	1.4	ND	11.9	9.1
1996	1.2	ND	10.4	9.2
1997	1.0	ND	17.2	9.7
1998	1.1	ND	15.8	8.9
1999	1.1	ND	14.1	9.4
2000	1.5	ND	13.2	9.5
2001	1.4	ND	13.4	9.3
2002	1.4	ND	13.9	10.4
2003	1.6	ND	17.2	9.9
2004	1.0	ND	13.1	9.9
2005	1.3	ND	12.1	10.3
2006	2.1	ND	7.3	9.6
2007	1.4	ND	7.4	10.0
2008	1.7	ND	6.2	8.8
2009	1.6	ND	6.2	9.4
2010	1.4	ND	8.6	7.0
2011	1.8	ND	6.1	9.6
2012	1.6	3.5	6.2	9.9
2013	0.4	ND	8.5	10.2
2014	1.4	ND	7.6	10.3
Summary 1979–2013				
Ave	1.3	ND	11.2	9.3
Min	0.4	ND	6.1	7.0
Max	2.1	ND	17.2	10.4

Note: Water level gain is the overall water level rise during the sonar season.

Table 13.—Daily (DIDSON) estimates of the sockeye salmon escapement into the Kaslof River, 2014.

Sockeye salmon					
Date	Daily	Cum	Date	Daily	Cum
15 Jun	7,587	7,587	15 Jul	17,310	267,241
16 Jun	6,352	13,939	16 Jul	12,312	279,553
17 Jun	7,201	21,140	17 Jul	10,566	290,119
18 Jun	13,296	34,436	18 Jul	21,720	311,839
19 Jun	17,850	52,286	19 Jul	10,410	322,249
20 Jun	16,206	68,492	20 Jul	9,762	332,011
21 Jun	9,720	78,212	21 Jul	16,926	348,937
22 Jun	7,824	86,036	22 Jul	8,310	357,247
23 Jun	7,554	93,590	23 Jul	9,246	366,493
24 Jun	4,235	97,825	24 Jul	9,649	376,142
25 Jun	10,620	108,445	25 Jul	5,712	381,854
26 Jun	19,794	128,239	26 Jul	5,146	387,000
27 Jun	4,050	132,289	27 Jul	4,212	391,212
28 Jun	4,194	136,483	28 Jul	4,411	395,623
29 Jun	2,652	139,135	29 Jul	6,462	402,085
30 Jun	7,256	146,391	30 Jul	5,346	407,431
1 Jul	3,084	149,475	31 Jul	10,110	417,541
2 Jul	6,780	156,255	1 Aug	7,037	424,578
3 Jul	6,606	162,861	2 Aug	4,022	428,600
4 Jul	3,180	166,041	3 Aug	1,422	430,023
5 Jul	7,440	173,481	4 Aug	3,135	433,158
6 Jul	10,140	183,621	5 Aug	1,954	435,112
7 Jul	11,334	194,955	6 Aug	2,990	438,102
8 Jul	6,810	201,765	7 Aug	2,090	440,192
9 Jul	11,052	212,817			
10 Jul	4,560	217,377			
11 Jul	10,386	227,763			
12 Jul	9,540	237,303			
13 Jul	4,318	241,621			
14 Jul	8,310	249,931			
Sockeye salmon 95% CI					438,380–442,003

Table 14.—Cumulative proportion by date of sockeye salmon escapement into the Kasilo River, 2000–2014.

Date	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
15 Jun	0.001	0.006	0.027	0.004	0.007	0.022	0.009	0.012	0.001	0.008	0.009	0.022	0.007	0.014	0.017
16 Jun	0.002	0.020	0.039	0.007	0.010	0.043	0.013	0.025	0.002	0.015	0.014	0.035	0.009	0.023	0.032
17 Jun	0.004	0.043	0.051	0.009	0.013	0.073	0.018	0.033	0.004	0.018	0.016	0.043	0.011	0.027	0.048
18 Jun	0.010	0.064	0.067	0.011	0.017	0.115	0.023	0.039	0.005	0.022	0.018	0.054	0.015	0.031	0.078
19 Jun	0.015	0.085	0.095	0.017	0.022	0.164	0.030	0.045	0.008	0.028	0.021	0.078	0.020	0.043	0.119
20 Jun	0.022	0.097	0.119	0.032	0.034	0.211	0.039	0.051	0.018	0.049	0.023	0.099	0.027	0.053	0.156
21 Jun	0.027	0.110	0.138	0.053	0.053	0.238	0.054	0.057	0.031	0.060	0.031	0.121	0.036	0.080	0.178
22 Jun	0.040	0.124	0.157	0.065	0.092	0.246	0.065	0.067	0.049	0.065	0.048	0.144	0.043	0.110	0.195
23 Jun	0.055	0.146	0.174	0.092	0.138	0.251	0.076	0.079	0.074	0.073	0.086	0.190	0.049	0.129	0.213
24 Jun	0.075	0.174	0.185	0.113	0.187	0.261	0.087	0.086	0.090	0.084	0.121	0.235	0.058	0.149	0.222
25 Jun	0.096	0.210	0.194	0.128	0.222	0.283	0.104	0.094	0.111	0.104	0.143	0.272	0.066	0.178	0.246
26 Jun	0.122	0.229	0.212	0.152	0.224	0.303	0.124	0.096	0.161	0.116	0.169	0.275	0.076	0.206	0.291
27 Jun	0.147	0.258	0.230	0.155	0.226	0.316	0.144	0.103	0.187	0.137	0.200	0.285	0.093	0.252	0.301
28 Jun	0.169	0.294	0.233	0.156	0.232	0.329	0.164	0.119	0.213	0.142	0.207	0.290	0.116	0.269	0.310
29 Jun	0.202	0.307	0.235	0.165	0.239	0.355	0.184	0.122	0.221	0.153	0.218	0.315	0.130	0.290	0.316
30 Jun	0.233	0.330	0.239	0.188	0.247	0.361	0.191	0.123	0.236	0.166	0.244	0.318	0.148	0.307	0.333
1 Jul	0.264	0.344	0.266	0.197	0.250	0.385	0.197	0.128	0.243	0.199	0.252	0.330	0.163	0.312	0.340
2 Jul	0.301	0.375	0.280	0.214	0.253	0.421	0.211	0.139	0.253	0.214	0.260	0.357	0.179	0.316	0.355
3 Jul	0.328	0.389	0.313	0.248	0.257	0.438	0.225	0.143	0.263	0.229	0.275	0.363	0.193	0.336	0.370
4 Jul	0.337	0.409	0.346	0.264	0.265	0.459	0.244	0.152	0.267	0.262	0.287	0.373	0.196	0.354	0.377
5 Jul	0.361	0.414	0.354	0.268	0.268	0.483	0.261	0.156	0.274	0.271	0.310	0.379	0.201	0.357	0.394
6 Jul	0.383	0.424	0.379	0.284	0.274	0.501	0.275	0.160	0.279	0.298	0.314	0.392	0.202	0.363	0.417
7 Jul	0.394	0.449	0.427	0.314	0.289	0.510	0.288	0.174	0.299	0.313	0.323	0.394	0.208	0.366	0.443
8 Jul	0.416	0.476	0.469	0.329	0.299	0.527	0.295	0.201	0.309	0.320	0.333	0.402	0.216	0.376	0.458
9 Jul	0.441	0.482	0.487	0.351	0.302	0.537	0.310	0.218	0.317	0.339	0.339	0.411	0.223	0.391	0.483
10 Jul	0.472	0.493	0.514	0.379	0.305	0.549	0.330	0.225	0.332	0.353	0.351	0.414	0.234	0.445	0.494
11 Jul	0.481	0.498	0.525	0.410	0.307	0.582	0.337	0.243	0.339	0.396	0.360	0.420	0.243	0.456	0.517
12 Jul	0.502	0.505	0.533	0.463	0.314	0.613	0.342	0.248	0.354	0.411	0.387	0.423	0.250	0.463	0.539
13 Jul	0.534	0.513	0.546	0.480	0.377	0.640	0.348	0.253	0.362	0.427	0.403	0.430	0.261	0.488	0.549
14 Jul	0.594	0.530	0.553	0.504	0.538	0.654	0.358	0.267	0.392	0.465	0.428	0.434	0.279	0.529	0.568
15 Jul	0.664	0.562	0.570	0.523	0.603	0.665	0.400	0.277	0.455	0.535	0.456	0.439	0.346	0.617	0.607
16 Jul	0.673	0.596	0.582	0.603	0.634	0.684	0.437	0.289	0.518	0.561	0.503	0.481	0.424	0.682	0.635
17 Jul	0.691	0.640	0.597	0.675	0.653	0.696	0.447	0.298	0.559	0.584	0.587	0.536	0.432	0.743	0.659
18 Jul	0.702	0.688	0.621	0.706	0.666	0.716	0.456	0.369	0.585	0.601	0.649	0.598	0.453	0.777	0.708

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Date	Cumulative proportion														
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
19 Jul	0.730	0.706	0.642	0.722	0.676	0.731	0.469	0.425	0.648	0.636	0.678	0.620	0.473	0.808	0.732
20 Jul	0.763	0.717	0.678	0.734	0.684	0.744	0.476	0.449	0.666	0.657	0.709	0.668	0.507	0.856	0.754
21 Jul	0.777	0.729	0.687	0.757	0.711	0.755	0.484	0.520	0.689	0.667	0.736	0.684	0.585	0.867	0.793
22 Jul	0.807	0.733	0.708	0.787	0.724	0.766	0.491	0.585	0.717	0.673	0.760	0.708	0.636	0.875	0.812
23 Jul	0.843	0.746	0.723	0.820	0.741	0.785	0.498	0.623	0.735	0.680	0.780	0.754	0.653	0.883	0.833
24 Jul	0.876	0.800	0.752	0.834	0.755	0.802	0.504	0.663	0.753	0.687	0.807	0.787	0.672	0.891	0.854
25 Jul	0.895	0.901	0.791	0.852	0.769	0.817	0.518	0.728	0.783	0.704	0.816	0.819	0.743	0.904	0.867
26 Jul	0.912	0.911	0.812	0.864	0.780	0.830	0.527	0.784	0.831	0.740	0.822	0.849	0.799	0.916	0.879
27 Jul	0.931	0.927	0.823	0.882	0.788	0.837	0.537	0.819	0.871	0.776	0.834	0.873	0.848	0.934	0.889
28 Jul	0.947	0.936	0.835	0.901	0.799	0.846	0.590	0.833	0.894	0.788	0.856	0.886	0.874	0.942	0.899
29 Jul	0.965	0.950	0.852	0.917	0.807	0.861	0.676	0.848	0.906	0.808	0.866	0.898	0.893	0.952	0.913
30 Jul	0.974	0.967	0.862	0.929	0.815	0.880	0.705	0.863	0.915	0.831	0.875	0.910	0.908	0.958	0.926
31 Jul	0.983	0.980	0.873	0.939	0.822	0.889	0.739	0.881	0.927	0.845	0.889	0.919	0.922	0.968	0.949
1 Aug	0.990	0.988	0.887	0.947	0.827	0.896	0.771	0.894	0.938	0.862	0.899	0.928	0.934	0.976	0.965
2 Aug	1.000	0.993	0.908	0.956	0.833	0.902	0.806	0.903	0.947	0.878	0.920	0.936	0.943	0.982	0.974
3 Aug	–	1.000	0.925	0.963	0.843	0.911	0.829	0.910	0.957	0.895	0.927	0.943	0.951	0.987	0.977
4 Aug	–	–	0.940	0.967	0.864	0.915	0.855	0.922	0.967	0.913	0.931	0.951	0.960	0.990	0.984
5 Aug	–	–	0.949	0.973	0.877	0.923	0.870	0.931	0.974	0.930	0.941	0.960	0.968	0.994	0.988
6 Aug	–	–	0.958	0.979	0.887	0.933	0.880	0.938	0.980	0.944	0.952	0.970	0.974	0.997	0.995
7 Aug	–	–	0.969	0.985	0.897	0.936	0.886	0.949	0.984	0.953	0.959	0.974	0.980	1.000	1.000
8 Aug	–	–	0.978	0.990	0.906	0.940	0.892	0.962	0.988	0.965	0.967	0.979	0.984	–	–
9 Aug	–	–	0.987	0.994	0.923	0.943	0.901	0.974	0.994	0.975	0.972	0.986	0.988	–	–
10 Aug	–	–	0.994	1.000	0.935	0.947	0.909	0.980	1.000	0.982	0.975	0.993	0.991	–	–
11 Aug	–	–	1.000	–	0.946	0.954	0.923	0.989	–	0.987	0.979	1.000	0.994	–	–
12 Aug	–	–	–	–	0.957	0.968	0.940	0.996	–	0.994	0.984	–	0.997	–	–
13 Aug	–	–	–	–	0.970	0.980	0.956	1.000	–	1.000	0.989	–	1.000	–	–
14 Aug	–	–	–	–	0.982	0.991	0.966	–	–	–	0.994	–	–	–	–
15 Aug	–	–	–	–	0.992	1.000	0.978	–	–	–	1.000	–	–	–	–
16 Aug	–	–	–	–	–	1.000	–	0.987	–	–	–	–	–	–	–
17 Aug	–	–	–	–	–	–	0.994	–	–	–	–	–	–	–	–
18 Aug	–	–	–	–	–	–	–	1.000	–	–	–	–	–	–	–
Run midpoint	12 Jul	12 Jul	10 Jul	14 Jul	14 Jul	6 Jul	24 Jul	21 Jul	16 Jul	15 Jul	16 Jul	17 Jul	20 Jul	14-Jul	11-Jul
Midpoint ave:	15 Jul														
Number of days in which 80% of escapement occurred															
Ave: 38	31	35	44	35	47	46	46	37	35	41	40	40	33	34	40

Table 15.—Daily fish wheel catch by species for the Kasilof River, 2014.

Date	Hours open	Sockeye		Pink		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
16 Jun	19.7	43	43	0	0	0	0	0	0
17 Jun	29.7	57	100	0	0	0	0	0	0
18 Jun	8.3	73	173	0	0	0	0	0	0
19 Jun	7.0	56	229	0	0	0	0	0	0
20 Jun	0.0	0	229	0	0	0	0	0	0
21 Jun	2.5	116	345	0	0	0	0	0	0
22 Jun	0.0	0	345	0	0	0	0	0	0
23 Jun	14.5	95	440	0	0	0	0	0	0
24 Jun	2.3	14	454	0	0	0	0	0	0
25 Jun	3.0	45	499	0	0	0	0	0	0
26 Jun	2.0	90	589	0	0	0	0	0	0
27 Jun	0.8	80	669	0	0	0	0	0	0
28 Jun	1.8	42	711	0	0	0	0	0	0
29 Jun	11.9	57	768	0	0	0	0	0	0
30 Jun	3.8	64	832	0	0	0	0	0	0
1 Jul	5.0	55	887	0	0	0	0	0	0
2 Jul	4.0	59	946	0	0	0	0	0	0
3 Jul	9.0	29	975	0	0	0	0	0	0
4 Jul	2.0	21	996	0	0	0	0	0	0
5 Jul	3.0	39	1,035	0	0	0	0	0	0
6 Jul	11.2	71	1,106	0	0	0	0	0	0
7 Jul	3.7	0	1,106	0	0	0	0	0	0
8 Jul	3.2	8	1,114	0	0	0	0	0	0
9 Jul	4.0	58	1,172	1	1	0	0	0	0
10 Jul	5.0	185	1,357	0	1	0	0	0	0
11 Jul	3.5	10	1,367	0	1	0	0	0	0
12 Jul	4.0	39	1,406	0	1	0	0	0	0
13 Jul	15.1	2	1,408	0	1	0	0	0	0
14 Jul	10.7	4	1,412	1	2	0	0	0	0
15 Jul	10.2	40	1,452	1	3	1	1	1	1
16 Jul	14.0	36	1,488	1	4	0	1	0	1
17 Jul	16.0	36	1,524	0	4	0	1	0	1
18 Jul	1.5	7	1,531	0	4	0	1	0	1
19 Jul	3.5	4	1,535	0	4	0	1	0	1
20 Jul	24.2	55	1,590	0	4	0	1	1	2
21 Jul	11.5	55	1,645	1	5	0	1	1	3
22 Jul	2.0	95	1,740	0	5	0	1	0	3
23 Jul	10.0	35	1,775	2	7	0	1	0	3
24 Jul	9.5	72	1,847	0	7	0	1	0	3
25 Jul	8.0	21	1,868	0	7	0	1	0	3
26 Jul	11.4	13	1,881	2	9	0	1	0	3
27 Jul	15.0	23	1,904	1	10	0	1	0	3
28 Jul	22.7	36	1,940	6	16	0	1	3	6
29 Jul	21.2	41	1,981	4	20	0	1	0	6
30 Jul	19.3	37	2,018	4	24	0	1	0	6
31 Jul	21.7	38	2,056	7	31	0	1	1	7

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Table 15.–Page 2 of 2.

Date	Hours open	Sockeye		Pink		Coho		Chinook									
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum								
1 Aug	22.5	59	2,115	7	38	0	1	0	7								
2 Aug	17.0	33	2,148	9	47	0	1	0	7								
3 Aug	12.6	8	2,156	22	69	0	1	0	7								
4 Aug	27.9	42	2,198	33	102	0	1	0	7								
5 Aug	18.6	34	2,232	29	131	0	1	1	8								
6 Aug	23.4	32	2,264	19	150	2	3	1	9								
7 Aug	24.3	15	2,279	23	173	0	3	3	12								
Total	558.4	92.4%		7.0%		0.1%		0.5%									
Total salmon: 2,467																	
CPUE (fish/h): 4.4																	
Efficiency: 4.5% of total north bank count (fish wheel catch adjusted to 24 hours).																	

Note: Fish wheel not operated 15 June because of low water. Fish wheel operations ended on 7 August.

Table 16.—Summary of north bank Kasilof River fish wheel catches and CPUE, 1984–2014.

Year	Total hours	Actual north bank fish wheel catch (salmon only)						Total catch	CPUE by species				Total CPUE		
		Sockeye	%	Pink	%	Coho	%	Chinook	%	Sockeye	Pink	Coho	Chinook		
1984	809.5	3,907	97.7	44	1.1	8	0.2	41	1.0	4,000	4.8	0.1	0.0	0.1	4.9
1985	747.0	4,996	98.3	49	1.0	4	0.1	32	0.6	5,081	6.7	0.1	0.0	0.0	6.8
1986	613.0	7,186	97.4	77	1.0	6	0.1	108	1.5	7,377	11.7	0.1	0.0	0.2	12.0
1987	768.4	3,910	96.2	20	0.5	0	0.0	136	3.3	4,066	5.1	0.0	0.0	0.2	5.3
1988	720.0	4,662	96.7	37	0.8	3	0.1	119	2.5	4,821	6.5	0.1	0.0	0.2	6.7
1989	959.1	4,017	94.0	154	3.6	5	0.1	99	2.3	4,275	4.2	0.2	0.0	0.1	4.5
1990	1,073.8	1,750	93.4	26	1.4	0	0.0	98	5.2	1,874	1.6	0.0	0.0	0.1	1.7
1991	557.7	1,889	95.9	65	3.3	1	0.1	14	0.7	1,969	3.4	0.1	0.0	0.0	3.5
1992	778.8	2,380	95.0	40	1.6	2	0.1	82	3.3	2,504	3.1	0.1	0.0	0.1	3.2
1993	840.0	2,100	93.9	52	2.3	0	0.0	85	3.8	2,237	2.5	0.1	0.0	0.1	2.7
1994	609.3	3,514	97.3	37	1.0	3	0.1	59	1.6	3,613	5.8	0.1	0.0	0.1	5.9
1995	678.2	2,023	96.4	28	1.3	1	0.0	46	2.2	2,098	3.0	0.0	0.0	0.1	3.1
1996	505.8	3,009	98.9	5	0.2	2	0.1	28	0.9	3,044	5.9	0.0	0.0	0.1	6.0
1997	505.0	2,076	97.0	16	0.7	3	0.1	46	2.1	2,141	4.1	0.0	0.0	0.1	4.2
1998	462.9	1,937	96.6	18	0.9	4	0.2	47	2.3	2,006	4.2	0.0	0.0	0.1	4.3
1999	503.0	1,952	92.1	108	5.1	2	0.1	58	2.7	2,120	3.9	0.2	0.0	0.1	4.2
2000	670.5	1,792	94.2	37	1.9	16	0.8	57	3.0	1,902	2.7	0.1	0.0	0.1	2.8
2001	391.4	1,765	96.4	23	1.3	1	0.1	42	2.3	1,831	4.5	0.1	0.0	0.1	4.7
2002	843.4	2,449	96.9	29	1.1	13	0.5	37	1.5	2,528	2.9	0.0	0.0	0.0	3.0
2003	822.2	1,704	98.3	15	0.9	0	0.0	14	0.8	1,733	2.1	0.0	0.0	0.0	2.1
2004	953.6	1,991	95.7	48	2.3	2	0.1	39	1.9	2,080	2.1	0.1	0.0	0.0	2.2
2005	785.1	1,812	95.5	66	3.5	0	0.0	19	1.0	1,897	2.3	0.1	0.0	0.0	2.4
2006	739.5	1,630	94.4	39	2.3	24	1.4	34	2.0	1,727	2.2	0.1	0.0	0.0	2.3
2007	877.3	1,580	97.8	15	0.9	4	0.2	17	1.1	1,616	1.8	0.0	0.0	0.0	1.8
2008	448.1	1,931	99.4	9	0.5	1	0.1	2	0.1	1,943	4.3	0.0	0.0	0.0	4.3
2009	514.2	1,390	96.8	42	2.9	0	0.0	4	0.3	1,436	2.7	0.1	0.0	0.0	2.8
2010	863.5	1,533	97.4	18	1.1	3	0.2	20	1.3	1,574	1.8	0.0	0.0	0.0	1.8
2011	601.2	1,395	98.7	12	0.8	1	0.1	5	0.4	1,413	2.3	0.0	0.0	0.0	2.4
2012	744.9	2,075	99.4	7	0.3	0	0.0	5	0.2	2,087	2.8	0.0	0.0	0.0	2.8
2013	799.3	2,006	98.2	21	1.0	1	0.0	15	0.7	2,043	2.5	0.0	0.0	0.0	2.6
2014	558.4	2,279	92.4	173	7.0	3	0.1	12	0.5	2,467	4.1	0.3	0.0	0.0	4.4
Ave		96.6		1.5		0.1		1.8			3.6	0.1	0.0	0.1	3.7
Min		92.1		0.2		0.0		0.1			1.6	0.0	0.0	0.0	1.7
Max		99.4		5.1		1.4		5.2			11.7	0.2	0.0	0.2	12.0
SD		1.8		1.1		0.3		1.2			2.0	0.0	0.0	0.0	2.1

Table 17.—Age composition of sockeye salmon sampled from the Kasilof River fish wheel catch, 1969–2014.

Year	% Composition by age class							n
	1.1	1.2	1.3	1.4	2.1	2.2	2.3	
1969	0.0	14.0	39.0	1.0	0.0	30.0	16.0	0.0 399
1970	0.0	2.0	37.0	2.0	0.0	16.0	11.0	2.0 297
1971	0.0	6.0	69.0	0.0	0.0	8.0	16.0	1.0 153
1972	0.0	42.0	36.0	1.0	0.0	3.0	18.0	0.0 668
1973	0.0	20.0	57.0	0.0	0.0	19.0	4.0	0.0 374
1974	0.0	35.0	59.0	0.0	0.0	4.0	2.0	0.0 254
1975	1.0	29.0	7.0	0.0	0.0	58.0	4.0	1.0 931
1976	0.2	35.9	24.1	0.0	0.0	28.2	11.4	0.2 755
1977	0.3	29.4	30.0	0.0	0.8	27.8	11.7	0.0 1,209
1978	0.0	41.3	40.1	0.0	0.0	10.4	8.2	0.0 967
1979	0.7	58.9	28.2	0.0	0.0	10.5	1.6	0.1 590
1980	2.1	67.0	23.1	0.1	0.0	5.0	2.7	0.0 899
1981	0.0	28.9	63.6	0.0	0.0	5.9	1.6	0.0 1,479
1982	0.8	30.6	54.4	0.0	0.2	9.3	4.7	0.0 1,518
1983	0.0	49.5	33.1	0.0	0.0	12.9	4.5	0.0 1,997
1984	0.0	50.5	24.8	0.0	0.2	17.9	6.6	0.0 2,269
1985	0.2	57.3	21.8	0.1	0.1	17.8	2.6	0.1 3,063
1986	0.0	40.9	42.0	0.3	0.1	11.9	4.6	0.2 1,660
1987	0.2	43.4	27.4	0.0	0.1	22.4	6.4	0.0 1,248
1988	0.1	33.7	36.4	0.2	0.1	17.6	12.0	0.0 2,282
1989	0.0	14.9	35.3	0.1	0.1	36.6	13.0	0.0 1,301
1990	0.4	32.9	20.7	0.3	0.0	33.2	12.4	0.3 762
1991	0.0	31.5	33.4	0.1	0.1	29.0	5.8	0.1 2,106
1992	0.0	21.1	27.5	0.0	0.2	35.3	16.0	0.0 1,717
1993	0.4	16.3	29.8	0.0	0.4	28.0	25.2	0.0 571
1994	0.0	26.4	28.4	0.0	0.0	28.2	17.0	0.0 723
1995	0.2	44.0	15.5	0.0	0.0	25.0	15.3	0.0 587
1996	0.0	24.8	48.3	0.0	0.0	21.4	5.6	0.0 721
1997	0.0	21.1	54.8	0.0	0.0	13.5	10.7	0.0 758
1998	0.1	39.7	28.1	0.4	0.6	22.2	8.9	0.0 857
1999	0.0	29.7	33.8	0.2	0.1	26.7	9.4	0.1 964
2000	0.1	41.9	33.9	0.0	0.4	11.4	12.3	0.0 747
2001	0.4	29.3	48.6	0.2	0.2	16.5	4.8	0.2 564
2002	0.3	33.9	38.1	0.3	1.5	19.3	6.6	0.1 746
2003	0.7	37.3	26.1	0.0	0.2	29.3	6.5	0.0 1,298
2004	0.1	43.7	18.9	0.1	0.2	32.6	4.3	0.1 908
2005	0.7	38.8	32.8	0.0	0.3	18.7	8.8	0.0 1,278
2006	0.5	35.3	30.5	0.0	0.4	27.4	5.8	0.1 737
2007	0.7	44.8	25.3	0.0	0.2	19.3	9.9	0.0 628
2008	0.4	39.5	38.3	0.0	0.2	17.9	3.7	0.0 448
2009	0.0	8.5	60.4	0.3	0.0	17.2	13.6	0.0 331
2010	1.1	27.7	31.2	0.0	1.5	31.2	7.1	0.2 477
2011	1.4	13.7	31.5	0.0	2.7	25.2	25.6	0.0 489
2012	6.8	34.0	10.6	0.0	4.4	37.6	6.6	0.0 473
2013	1.9	34.5	26.7	0.0	1.2	31.8	3.7	0.2 516
2014	1.7	42.4	29.4	0.0	2.7	20.6	2.9	0.4 524
Ave (1969–13)	0.5	32.9	34.7	0.1	0.4	21.6	9.1	0.1 972

Table 18.—Average lengths of the major age classes of sockeye salmon sampled from the Kaslof River fish wheel, 1982–2014.

Year	Age class	Male		Female		Total		Ratio Male: Female	Age class	Male		Female		Total		Ratio Male: Female
		Length (mm)	n	Length (mm)	n	Length (mm)	n			Length (mm)	n	Length (mm)	n	Length (mm)	n	
1982	1.2	481	285	466	235	474	520	1.2:1	1.3	549	377	542	428	545	805	0.9:1
1983		493	113	491	78	492	191	1.4:1		558	170	547	187	552	357	0.9:1
1984		480	544	478	428	479	972	2.6:1		539	304	533	383	535	687	0.8:1
1985		474	723	472	897	473	1620	0.8:1		531	341	527	433	529	774	0.8:1
1986		482	266	482	368	482	634	0.7:1		550	342	543	405	546	747	0.8:1
1987		472	282	470	257	471	539	1.1:1		553	191	551	154	552	345	1.2:1
1988		480	353	477	480	478	833	0.7:1		550	311	543	382	546	693	0.8:1
1989		476	77	476	107	476	184	0.8:1		552	233	544	253	547	486	0.9:1
1990		462	139	458	91	460	230	1.5:1		518	81	523	106	521	187	0.8:1
1991		467	326	461	305	464	631	1.1:1		531	418	518	335	525	753	1.3:1
1992		468	184	465	212	467	396	0.9:1		535	195	527	197	531	392	1.0:1
1993		479	40	479	53	479	93	0.8:1		550	101	542	69	547	170	1.5:1
1994		465	96	466	95	465	191	1.0:1		539	102	530	103	535	205	1.0:1
1995		491	117	483	141	487	258	0.8:1		542	42	534	49	538	91	0.9:1
1996		476	96	475	83	475	179	1.2:1		565	214	557	134	562	348	1.6:1
1997		456	80	452	80	454	160	1.0:1		555	223	541	192	548	415	1.2:1
1998		475	178	468	162	472	340	1.1:1		527	110	525	131	526	241	0.8:1
1999		479	140	474	146	476	286	1.0:1		543	167	542	159	542	326	1.1:1
2000		481	162	474	162	478	324	1.0:1		555	140	547	122	551	262	1.2:1
2001		479	77	477	88	478	165	0.9:1		549	149	545	125	547	274	1.2:1
2002		486	114	476	139	480	253	0.8:1		555	144	544	140	549	284	1.1:1
2003		481	230	480	247	481	477	0.9:1		546	167	546	207	546	374	0.8:1
2004		482	181	475	216	478	397	0.8:1		549	82	539	90	544	172	0.9:1
2005		470	260	468	350	469	610	0.7:1		544	142	543	149	543	291	1:1
2006		464	112	458	148	461	260	0.8:1		519	111	513	114	516	225	1.0:1
2007		468	127	464	154	466	281	0.8:1		545	77	538	82	542	159	0.9:1
2008		456	100	454	103	455	203	1.0:1		539	67	533	61	536	128	1.1:1
2009		483	15	485	13	484	28	1.2:1		547	96	542	104	545	200	0.9:1
2010		471	54	466	78	468	132	0.7:1		538	64	532	85	534	149	0.8:1
2011		461	35	465	32	463	67	1.1:1		551	59	549	95	549	154	0.6:1
2012		530	83	466	78	499	161	1.1:1		548	16	530	34	536	50	0.5:1
2013		470	81	467	97	469	178	0.8:1		544	73	537	65	541	138	1.1:1
2014		465	110	465	112	465	222	.98:1		537	71	533	83	535	154	0.9:1
Ave (1982–2013)		476	177	471	191	474	369	0.9:1		544	166	538	174	541	340	.95:1

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Table 18.–Page 2 of 2.

Year	Age class	Male			Female			Total		Ratio Male: Female	Age class	Male			Female		Total		Ratio Male: Female
		Length (mm)	n	Length (mm)	n	Length (mm)	n	Length (mm)	n			Length (mm)	n	Length (mm)	n	Length (mm)	n		
1982	2.2	479	65	472	81	475	146	0.8:1	2.3	548	41	543	40	546	81	1.0:1			
1983		ND	ND	ND	ND	ND	ND			ND	ND	ND	ND	546	ND	ND			
1984		484	202	482	223	483	425	0.9:1		533	102	526	80	530	182	1.3:1			
1985		482	248	476	319	479	567	0.8:1		ND	ND	ND	ND	ND	ND	ND	ND	ND	
1986		492	78	489	115	490	193	0.7:1		ND	ND	ND	ND	ND	ND	ND	ND	ND	
1987		478	137	474	141	476	278	1.0:1		548	37	541	44	544	81	0.8:1			
1988		486	173	479	220	482	393	0.8:1		544	104	543	115	543	219	0.9:1			
1989		479	200	480	253	479	453	0.8:1		535	94	537	82	536	176	1.1:1			
1990		453	104	457	111	455	215	0.9:1		514	63	529	61	522	124	1.0:1			
1991		471	289	480	301	475	590	1.0:1		516	61	514	64	515	125	1.0:1			
1992		464	264	465	427	464	691	0.6:1		534	112	532	122	533	234	0.9:1			
1993		486	58	480	102	482	160	0.7:1		542	66	533	78	537	144	0.8:1			
1994		469	96	470	108	470	204	0.9:1		545	49	528	74	535	123	0.7:1			
1995		492	61	485	86	488	147	0.7:1		546	42	536	48	541	90	0.9:1			
1996		482	69	472	85	476	154	0.8:1		553	21	556	19	554	40	1.1:1			
1997		459	47	450	55	454	102	0.9:1		546	39	526	42	536	81	0.9:1			
1998		473	95	469	95	471	190	1.0:1		523	40	519	36	521	76	1.1:1			
1999		480	125	475	132	477	257	1.0:1		538	41	530	50	534	91	0.8:1			
2000		486	36	482	52	483	88	0.7:1		551	47	551	48	551	95	1.0:1			
2001		482	41	473	52	477	93	0.8:1		556	17	540	10	550	27	1.7:1			
2002		480	50	470	94	473	144	0.5:1		550	25	546	24	548	49	1.0:1			
2003		481	162	479	186	480	348	0.9:1		546	39	537	53	541	92	0.7:1			
2004		482	126	475	170	478	296	0.7:1		536	25	523	14	531	39	1.8:1			
2005		478	109	467	165	472	274	0.7:1		544	40	533	48	539	88	0.8:1			
2006		464	82	466	120	465	202	0.7:1		527	21	521	22	524	43	1.0:1			
2007		465	53	462	68	463	121	0.8:1		526	36	517	26	522	62	1.4:1			
2008		462	41	458	56	460	97	0.7:1		532	11	501	6	520	17	1.8:1			
2009		481	23	480	34	481	57	0.7:1		544	24	531	21	538	45	1.1:1			
2010		472	59	474	90	473	149	0.7:1		526	19	521	15	524	34	1.3:1			
2011		469	54	469	69	469	123	0.8:1		550	59	543	66	547	125	0.9:1			
2012		481	78	468	100	474	178	0.8:1		536	18	527	13	532	31	1.4:1			
2013		475	82	475	82	475	164	1.0:1		547	11	523	8	537	19	1.4:1			
2014		480	47	476	61	478	108	0.8:1		544	5	524	10	531	15	0.5:1			
Ave (1982–2013)		476	107	473	135	474	242	0.8:1		539	45	531	46	536	91	1.0:1			
2014 (all ages)		482	255	490	269	486	524	.95:1											

Table 19.—Minimum and maximum (DIDSON) salmon escapement estimates into the Yentna River drainage, 7 July–8 August, 2014.

Date	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	559	763	559	763	17	129	17	129
8 Jul	669	724	1,228	1,487	8	63	24	192
9 Jul	972	1,223	2,199	2,710	41	282	65	474
10 Jul	916	1,199	3,116	3,909	60	359	126	833
11 Jul	637	1,145	3,753	5,054	107	545	233	1,378
12 Jul	847	1,210	4,601	6,265	45	343	278	1,722
13 Jul	1,363	2,202	5,964	8,467	132	882	410	2,603
14 Jul	2,401	3,991	8,365	12,458	368	2,053	778	4,657
15 Jul	3,587	6,455	11,952	18,913	1,138	4,779	1,916	9,436
16 Jul	2,024	4,606	13,976	23,519	1,856	5,927	3,772	15,363
17 Jul	1,946	5,333	15,923	28,852	2,999	7,984	6,771	23,346
18 Jul	2,808	8,992	18,731	37,843	5,746	13,924	12,517	37,270
19 Jul	4,055	12,000	22,786	49,843	7,131	17,823	19,649	55,093
20 Jul	5,360	12,705	28,146	62,548	5,722	17,675	25,371	72,768
21 Jul	4,371	10,436	32,517	72,984	4,831	15,914	30,202	88,682
22 Jul	3,415	7,845	35,932	80,829	3,003	10,463	33,205	99,145
23 Jul	2,956	6,878	38,888	87,707	2,450	9,401	35,655	108,546
24 Jul	1,892	4,690	40,780	92,396	1,090	5,400	36,745	113,946
25 Jul	1,566	3,933	42,345	96,329	708	3,899	37,453	117,845
26 Jul	2,408	6,551	44,753	102,880	527	3,762	37,981	121,607
27 Jul	1,326	4,334	46,079	107,214	518	3,336	38,499	124,943
28 Jul	944	3,287	47,023	110,502	410	2,763	38,909	127,707
29 Jul	858	2,452	47,881	112,953	234	1,518	39,143	129,224
30 Jul	2,070	4,934	49,951	117,888	271	1,953	39,413	131,178
31 Jul	1,318	2,725	51,269	120,612	127	861	39,540	132,039
1 Aug	1,044	3,293	52,313	123,905	139	1,156	39,679	133,195
2 Aug	706	3,447	53,020	127,353	128	1,151	39,808	134,346
3 Aug	626	3,336	53,646	130,688	90	815	39,898	135,161
4 Aug	592	2,129	54,237	132,817	41	322	39,939	135,483
5 Aug	541	1,449	54,779	134,266	70	456	40,008	135,939
6 Aug	324	889	55,102	135,155	30	213	40,038	136,152
7 Aug	370	990	55,473	136,146	23	184	40,061	136,336
8 Aug	287	1,111	55,759	137,256	23	205	40,084	136,541
% Total of min & max:		36.8%	28.4%			26.4%	28.2%	

-continued-

Table 19.–Page 2 of 2.

Date	Chum				Coho			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	49	185	49	185	0	0	0	0
8 Jul	0	0	49	185	0	0	0	0
9 Jul	36	140	84	325	15	148	15	148
10 Jul	53	201	138	525	37	277	51	425
11 Jul	22	88	160	614	116	736	167	1,161
12 Jul	24	102	184	716	57	432	224	1,593
13 Jul	104	363	287	1,079	135	1,021	359	2,614
14 Jul	399	1,243	686	2,322	184	1,520	544	4,133
15 Jul	391	1,236	1,077	3,558	326	2,718	870	6,851
16 Jul	349	1,008	1,426	4,566	406	3,178	1,275	10,029
17 Jul	346	1,029	1,773	5,595	353	3,073	1,628	13,102
18 Jul	326	1,023	2,098	6,618	349	3,497	1,978	16,598
19 Jul	528	1,643	2,627	8,261	526	5,009	2,504	21,607
20 Jul	446	1,356	3,073	9,617	1,346	10,027	3,850	31,634
21 Jul	948	2,718	4,020	12,335	1,602	10,818	5,452	42,452
22 Jul	960	2,899	4,981	15,234	1,365	8,574	6,817	51,026
23 Jul	813	2,289	5,794	17,523	1,075	7,141	7,892	58,167
24 Jul	714	2,104	6,508	19,628	1,220	6,342	9,113	64,509
25 Jul	640	2,054	7,148	21,682	1,385	6,279	10,497	70,788
26 Jul	604	2,239	7,752	23,920	2,391	9,406	12,888	80,194
27 Jul	660	1,762	8,412	25,682	2,282	7,721	15,170	87,915
28 Jul	664	1,992	9,077	27,674	2,164	6,979	17,334	94,894
29 Jul	890	2,221	9,967	29,895	1,055	4,213	18,389	99,107
30 Jul	1,569	4,688	11,536	34,582	1,401	6,617	19,790	105,723
31 Jul	721	2,108	12,257	36,690	425	2,445	20,215	108,168
1 Aug	1,049	3,493	13,306	40,183	1,894	6,537	22,109	114,705
2 Aug	1,317	4,681	14,624	44,864	5,126	11,839	27,234	126,545
3 Aug	905	3,505	15,529	48,369	5,222	11,013	32,456	137,558
4 Aug	825	2,422	16,353	50,791	1,386	4,397	33,841	141,955
5 Aug	1,312	2,924	17,666	53,715	627	2,752	34,468	144,707
6 Aug	903	2,103	18,569	55,818	408	1,855	34,876	146,562
7 Aug	592	1,535	19,161	57,352	433	1,815	35,309	148,377
8 Aug	420	1,437	19,581	58,790	979	2,801	36,288	151,178
% Total of min & max:		12.9%	12.2%			23.9%	31.3%	

Table 20.—Cumulative proportion by date of sockeye salmon escapement recorded in the Yentna River, 1997–2014.

Date	Cumulative proportion ^a																	
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
7 Jul	0.004	0.003	0.000	0.007	0.005	0.029	0.004	0.002	0.007	0.004	0.000	0.001	0.001	0.001	0.001	0.001	0.002	0.007
8 Jul	0.006	0.006	0.001	0.013	0.010	0.101	0.007	0.004	0.017	0.006	0.001	0.002	0.003	0.002	0.004	0.004	0.005	0.014
9 Jul	0.009	0.010	0.002	0.020	0.015	0.155	0.010	0.006	0.021	0.009	0.001	0.004	0.004	0.004	0.006	0.004	0.007	0.025
10 Jul	0.011	0.017	0.005	0.024	0.023	0.187	0.014	0.007	0.028	0.013	0.002	0.006	0.008	0.005	0.009	0.005	0.010	0.036
11 Jul	0.013	0.030	0.010	0.033	0.029	0.207	0.018	0.008	0.035	0.018	0.002	0.007	0.013	0.007	0.012	0.006	0.017	0.046
12 Jul	0.016	0.043	0.017	0.046	0.041	0.226	0.023	0.010	0.041	0.022	0.002	0.010	0.024	0.009	0.014	0.008	0.029	0.056
13 Jul	0.030	0.051	0.024	0.075	0.050	0.236	0.051	0.011	0.057	0.024	0.004	0.013	0.045	0.016	0.015	0.012	0.040	0.075
14 Jul	0.087	0.056	0.031	0.124	0.058	0.251	0.126	0.014	0.081	0.026	0.004	0.017	0.074	0.034	0.019	0.014	0.051	0.108
15 Jul	0.149	0.059	0.044	0.263	0.068	0.271	0.192	0.092	0.109	0.027	0.005	0.068	0.113	0.063	0.023	0.017	0.059	0.160
16 Jul	0.197	0.064	0.057	0.407	0.098	0.328	0.239	0.263	0.131	0.031	0.006	0.148	0.189	0.098	0.028	0.023	0.107	0.194
17 Jul	0.229	0.072	0.068	0.490	0.184	0.446	0.261	0.377	0.147	0.042	0.009	0.228	0.281	0.163	0.034	0.073	0.180	0.232
18 Jul	0.254	0.094	0.081	0.600	0.270	0.535	0.316	0.457	0.165	0.087	0.013	0.299	0.336	0.223	0.145	0.188	0.316	0.293
19 Jul	0.280	0.159	0.108	0.730	0.359	0.570	0.372	0.519	0.205	0.160	0.015	0.387	0.377	0.266	0.386	0.217	0.434	0.376
20 Jul	0.316	0.239	0.160	0.849	0.414	0.628	0.489	0.555	0.242	0.217	0.040	0.538	0.416	0.332	0.512	0.240	0.533	0.470
21 Jul	0.367	0.304	0.222	0.910	0.423	0.684	0.611	0.573	0.273	0.239	0.091	0.636	0.459	0.399	0.610	0.269	0.657	0.547
22 Jul	0.434	0.327	0.319	0.950	0.429	0.734	0.678	0.593	0.303	0.257	0.160	0.700	0.497	0.474	0.689	0.345	0.720	0.605
23 Jul	0.492	0.338	0.433	0.969	0.480	0.754	0.706	0.619	0.326	0.285	0.251	0.779	0.531	0.529	0.719	0.471	0.746	0.656
24 Jul	0.544	0.357	0.510	0.978	0.563	0.783	0.747	0.657	0.365	0.307	0.320	0.821	0.567	0.573	0.735	0.574	0.771	0.690
25 Jul	0.606	0.378	0.567	0.984	0.630	0.807	0.783	0.681	0.430	0.325	0.374	0.851	0.591	0.609	0.765	0.634	0.789	0.718
26 Jul	0.668	0.403	0.605	0.989	0.704	0.820	0.813	0.711	0.485	0.353	0.417	0.862	0.609	0.649	0.799	0.717	0.818	0.765
27 Jul	0.697	0.426	0.653	0.994	0.803	0.835	0.844	0.722	0.516	0.390	0.450	0.868	0.623	0.686	0.817	0.791	0.842	0.794
28 Jul	0.722	0.454	0.702	0.996	0.880	0.855	0.865	0.729	0.532	0.459	0.514	0.878	0.646	0.736	0.843	0.832	0.888	0.816
29 Jul	0.743	0.493	0.767	0.996	0.921	0.871	0.881	0.739	0.555	0.564	0.564	0.890	0.684	0.768	0.879	0.852	0.917	0.833
30 Jul	0.767	0.560	0.804	0.997	0.944	0.891	0.892	0.756	0.581	0.630	0.589	0.897	0.734	0.792	0.901	0.865	0.933	0.870
31 Jul	0.795	0.622	0.848	0.999	0.954	0.906	0.909	0.781	0.628	0.698	0.603	0.907	0.756	0.820	0.915	0.877	0.951	0.891
1 Aug	0.826	0.684	0.878	1.000	0.970	0.918	0.941	0.792	0.677	0.733	0.619	0.914	0.787	0.851	0.924	0.889	0.972	0.913
2 Aug	0.852	0.762	0.895	—	0.985	0.931	0.963	0.809	0.718	0.769	0.647	0.924	0.838	0.870	0.932	0.899	0.982	0.934
3 Aug	0.870	0.830	0.914	—	0.991	0.947	0.977	0.826	0.766	0.825	0.687	0.939	0.881	0.889	0.937	0.918	0.990	0.955
4 Aug	0.893	0.876	0.934	—	0.994	0.964	0.983	0.851	0.792	0.867	0.725	0.959	0.915	0.918	0.938	0.933	0.994	0.969
5 Aug	0.911	0.907	0.947	—	1.000	0.979	0.990	0.882	0.810	0.897	0.743	0.973	0.932	0.932	0.939	0.951	0.997	0.979
6 Aug	0.923	0.927	0.955	—	—	0.990	1.000	0.910	0.844	0.919	0.758	0.981	0.947	0.941	0.943	0.970	1.000	0.986
7 Aug	0.931	0.938	0.963	—	—	0.996	—	0.934	0.895	0.948	0.790	0.986	0.962	0.950	0.955	0.979	—	0.993
8 Aug	0.945	0.947	0.971	—	—	1.000	—	0.953	0.917	0.970	0.826	0.989	0.977	0.958	0.965	0.982	—	1.000
9 Aug	0.961	0.953	0.978	—	—	—	—	0.968	0.948	0.982	0.871	0.994	0.986	0.968	0.975	0.987	—	—

-continued-

Table 20.–Page 2 of 2.

Date	Cumulative proportion ^a																	
	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
10 Aug	0.982	0.959	0.988	–	–	–	–	0.981	0.968	0.989	0.898	1.000	0.992	0.975	0.982	0.990	–	–
11 Aug	0.992	0.966	0.994	–	–	–	–	0.993	0.979	0.994	0.933	–	0.995	0.982	0.989	0.992	–	–
12 Aug	1.000	0.973	0.997	–	–	–	–	1.000	0.992	1.000	0.975	–	1.000	0.987	0.994	0.994	–	–
13 Aug	–	0.979	0.999	–	–	–	–	–	1.000	–	0.991	–	–	0.993	0.996	0.996	–	–
14 Aug	–	0.984	1.000	–	–	–	–	–	–	–	0.994	–	–	0.998	0.999	0.998	–	–
15 Aug	–	0.986	–	–	–	–	–	–	–	–	0.997	–	–	1.000	1.000	1.000	–	–
16 Aug	–	0.988	–	–	–	–	–	–	–	–	1.000	–	–	–	–	–	–	–
17 Aug	–	0.991	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
18 Aug	–	0.993	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
19 Aug	–	0.996	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
20 Aug	–	0.998	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
21 Aug	–	1.000	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Run midpoint	24 Jul	30 Jul	24 Jul	18 Jul	24 Jul	18 Jul	21 Jul	19 Jul	27 Jul	29 Jul	28 Jul	20 Jul	23 Jul	23 Jul	20 Jul	24 Jul	20 Jul	21 Jul
Midpoint ave:	23 Jul																	

Number of days in which 80% of escapement occurred

Ave: 19 22 18 16 8 13 24 18 22 25 19 22 16 21 19 13 17 14 18

^a Proportion averaged from minimum and maximum daily migration estimates (2010–2014).

Table 21.—Daily fish wheel catch by species for the north bank of the Yentna River, 2014.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	17.0	24	24	6	6	2	0	0	0	5	5
8 Jul	17.4	28	52	6	12	0	0	0	0	4	9
9 Jul	17.3	27	79	26	38	4	4	1	1	1	10
10 Jul	17.4	13	92	42	80	4	8	9	10	1	11
11 Jul	17.1	12	104	42	122	1	9	2	12	0	11
12 Jul	17.3	16	120	6	128	1	10	4	16	2	13
13 Jul	17.4	18	138	24	152	6	16	4	20	1	14
14 Jul	17.0	36	174	113	265	26	42	10	30	1	15
15 Jul	17.0	25	199	218	483	11	53	7	37	1	16
16 Jul	17.5	13	212	316	799	17	70	12	49	1	17
17 Jul	17.4	19	231	485	1,284	10	80	11	60	1	18
18 Jul	17.4	19	250	694	1,978	11	91	13	73	1	19
19 Jul	16.0	31	281	661	2,639	20	111	10	83	2	21
20 Jul	17.3	45	326	833	3,472	23	134	30	113	0	21
21 Jul	17.3	32	358	548	4,020	30	164	33	146	1	22
22 Jul	17.2	22	380	397	4,417	35	199	29	175	0	22
23 Jul	17.3	33	413	353	4,770	24	223	41	216	0	22
24 Jul	17.3	52	465	232	5,002	34	257	44	260	2	24
25 Jul	16.7	28	493	146	5,148	19	276	39	299	1	25
26 Jul	17.5	23	516	121	5,269	25	301	77	376	0	25
27 Jul	17.1	26	542	88	5,357	35	336	34	410	0	25
28 Jul	17.1	23	565	80	5,437	34	370	46	456	1	26
29 Jul	16.8	11	576	57	5,494	57	427	28	484	2	28
30 Jul	17.1	27	603	56	5,550	58	485	33	517	1	29
31 Jul	17.2	58	661	64	5,614	63	548	38	555	2	31
1 Aug	17.0	24	685	27	5,641	42	590	60	615	1	32
2 Aug	17.2	16	701	25	5,666	58	648	84	699	0	32
3 Aug	17.0	14	715	28	5,694	50	698	85	784	0	32
4 Aug	16.6	10	725	14	5,708	53	751	37	821	0	32
5 Aug	17.1	12	737	19	5,727	68	819	17	838	1	33
6 Aug	17.1	14	751	11	5,738	62	881	25	863	1	34
7 Aug	17.0	7	758	8	5,746	75	956	32	895	0	34
8 Aug	17.1	17	775	12	5,758	40	996	53	948	0	34
Total	565.2		9.1		67.7		11.7		11.1		0.4

Total salmon 8,511

CPUE (fish/h): 15.1

Trap efficiency: ~15.7% of total north bank sonar estimate (if catch is adjusted through 24 hours).

Note: Other species included whitefish, longnose suckers, Dolly Varden, rainbow trout and a burbot.

Table 22.—Summary of fish wheel catch and CPUE by species for the north bank of the Yentna River, 1985–2014.

Year	Total hours	Actual fish wheel catch - north bank										Total catch	CPUE by species					Total CPUE
		Sockeye	%	Pink	%	Chum	%	Coho	%	King	%		Sockeye	Pink	Chum	Coho	King	
1985	702.5	1,099	17.5	4,415	70.4	502	8.0	241	3.8	14	0.2	6,271	1.6	6.3	0.6	0.3	0.0	8.9
1986	573.2	219	4.9	3,571	80.6	362	8.2	194	4.4	83	1.9	4,429	0.4	6.2	0.9	0.3	0.1	7.7
1987	936.4	1,393	25.5	2,983	54.5	876	16.0	172	3.1	47	0.9	5,471	1.5	3.2	2.8	0.2	0.1	5.8
1988	517.2	981	16.6	3,320	56.2	1,433	24.2	137	2.3	39	0.7	5,910	1.9	6.4	4.6	0.3	0.1	11.4
1989	790.2	2,016	13.8	8,099	55.3	3,669	25.1	803	5.5	46	0.3	14,633	2.6	10.2	2.3	1.0	0.1	18.5
1990	517.6	867	11.5	5,246	69.5	1,165	15.4	248	3.3	27	0.4	7,553	1.7	10.1	1.8	0.5	0.1	14.6
1991	530.1	768	16.2	2,071	43.8	946	20.0	932	19.7	15	0.3	4,732	1.4	3.9	2.3	1.8	0.0	8.9
1992	582.6	693	8.2	5,867	69.7	1,345	16.0	499	5.9	13	0.2	8,417	1.2	10.1	1.4	0.9	0.0	14.4
1993	399.1	931	13.9	4,789	71.3	549	8.2	432	6.4	17	0.3	6,718	2.3	12.0	1.5	1.1	0.0	16.8
1994	492.1	1,374	28.6	2,309	48.0	734	15.3	379	7.9	10	0.2	4,806	2.8	4.7	1.6	0.8	0.0	9.8
1995	511.8	815	17.8	2,343	51.0	826	18.0	587	12.8	19	0.4	4,590	1.6	4.6	0.9	1.1	0.0	9.0
1996	472.4	708	16.0	2,815	63.6	409	9.2	481	10.9	13	0.3	4,426	1.5	6.0	0.6	1.0	0.0	9.4
1997	849.5	2,294	48.1	1,610	33.8	551	11.6	301	6.3	14	0.3	4,770	2.7	1.9	1.0	0.4	0.0	5.6
1998	1,094.1	12,067	37.7	17,057	53.3	1,102	3.4	1,712	5.4	54	0.2	31,992	11.0	15.6	1.0	1.6	0.0	29.2
1999	206.0	1,004	33.5	1,301	43.4	211	7.0	464	15.5	16	0.5	2,996	4.9	6.3	1.2	2.3	0.1	14.5
2000	133.9	904	14.8	4,710	76.9	155	2.5	345	5.6	9	0.1	6,123	6.8	35.2	3.5	2.6	0.1	45.7
2001	145.1	898	13.6	4,705	71.4	501	7.6	477	7.2	13	0.2	6,594	6.2	32.4	3.2	3.3	0.1	45.4
2002	161.7	564	6.3	7,286	80.9	516	5.7	618	6.9	17	0.2	9,001	3.5	45.1	3.4	3.8	0.1	55.7
2003	179.5	2,331	34.5	3,367	49.9	602	8.9	442	6.5	12	0.2	6,754	13.0	18.8	1.4	2.5	0.1	37.6
2004	243.3	394	5.8	4,613	68.1	338	5.0	1,406	20.8	22	0.3	6,773	1.6	19.0	0.8	5.8	0.1	27.8
2005	314.3	582	13.2	2,131	48.5	250	5.7	1,420	32.3	13	0.3	4,396	1.9	6.8	0.8	4.5	0.0	14.0
2006	640.8	1,472	5.7	19,480	75.0	705	2.7	4,295	16.5	27	0.1	25,979	2.3	30.4	1.1	6.7	0.0	40.5
2007	242.9	554	14.4	2,349	61.1	152	4.0	786	20.4	6	0.2	3,847	2.3	9.7	0.6	3.2	0.0	15.8
2008	197.3	752	13.8	3,949	72.6	194	3.6	528	9.7	18	0.3	5,441	3.8	20.0	1.0	2.7	0.1	27.6
2009	631.4	1,061	1.9	50,671	91.5	1,262	2.3	2,363	4.3	33	0.1	55,390	1.7	80.3	2.0	3.7	0.1	87.7
2010	997.2	2,038	13.6	8,821	58.7	2,031	13.5	2,110	14.0	21	0.1	15,021	2.0	8.8	2.0	2.1	0.0	15.1
2011	961.0	1,338	6.9	9,775	50.3	5,093	26.2	3,202	16.5	23	0.1	19,431	1.4	10.2	5.3	3.3	0.0	20.2
2012	904.5	965	5.1	15,319	81.1	387	2.0	2,191	11.6	34	0.2	18,896	1.1	16.9	0.4	2.4	0.0	20.9
2013	206.9	134	2.7	4,230	85.0	93	1.9	503	10.1	17	0.3	4,977	0.6	20.4	0.4	2.4	0.1	24.1
2014	565.2	775	9.1	5,758	67.7	996	11.7	948	11.1	34	0.4	8,511	1.4	10.2	1.8	1.7	0.1	15.1
Historical ave		13.3	68.9		8.7		8.9		0.2			2.3	11.9	1.5	1.5	0.0	17.3	
Historical min		1.9	33.8		1.9		1.1		0.1			0.4	1.7	0.2	0.1	0.0	2.7	
Historical max		48.1	91.5		26.2		32.3		1.9			13.0	80.3	5.3	6.7	0.1	87.7	
Historical SD		10.9	14.5		7.0		6.9		0.4			2.9	15.8	1.2	1.7	0.0	18.0	
Pre 1998 ave %		15.7	63.6		14.4		5.9		0.4			1.4	5.7	1.3	0.5	0.0	9.0	
1998-present		12.0	71.3		6.3		10.3		0.2			3.6	21.2	1.9	3.0	0.0	29.7	

Table 23.—Daily fish wheel catch by species for the south bank of the Yentna River, 2014.

Date	Hours open	Sockeye		Pink		Chum		Coho		Chinook	
		Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
7 Jul	17.1	32	32	6	6	5	5	0	0	1	1
8 Jul	17.4	24	56	1	7	0	5	0	0	0	1
9 Jul	17.3	65	121	14	21	3	8	2	2	1	2
10 Jul	17.4	54	175	13	34	4	12	2	4	0	2
11 Jul	17.0	55	230	24	58	2	14	14	18	0	2
12 Jul	17.3	111	341	39	97	4	18	9	27	0	2
13 Jul	17.3	158	499	76	173	11	29	24	51	1	3
14 Jul	17.2	153	652	102	275	26	55	19	70	0	3
15 Jul	17.0	120	772	129	404	14	69	18	88	0	3
16 Jul	17.5	82	854	181	585	11	80	23	111	0	3
17 Jul	17.3	81	935	245	830	13	93	20	131	1	4
18 Jul	17.3	90	1,025	348	1,178	9	102	14	145	0	4
19 Jul	16.2	131	1,156	409	1,587	12	114	23	168	1	5
20 Jul	17.2	253	1,409	619	2,206	15	129	88	256	2	7
21 Jul	17.4	149	1,558	354	2,560	22	151	69	325	0	7
22 Jul	17.1	147	1,705	220	2,780	25	176	66	391	1	8
23 Jul	17.2	146	1,851	297	3,077	30	206	60	451	1	9
24 Jul	17.5	119	1,970	168	3,245	27	233	79	530	0	9
25 Jul	17.2	99	2,069	94	3,339	27	260	74	604	1	10
26 Jul	17.2	154	2,223	91	3,430	25	285	109	713	0	10
27 Jul	17.4	68	2,291	52	3,482	6	291	82	795	0	10
28 Jul	17.1	47	2,338	37	3,519	9	300	67	862	0	10
29 Jul	17.1	55	2,393	28	3,547	17	317	49	911	0	10
30 Jul	17.3	58	2,451	23	3,570	31	348	37	948	0	10
31 Jul	17.4	108	2,559	21	3,591	37	385	34	982	0	10
1 Aug	17.4	98	2,657	32	3,623	54	439	108	1,090	0	10
2 Aug	17.5	57	2,714	17	3,640	38	477	179	1,269	0	10
3 Aug	17.2	65	2,779	13	3,653	38	515	220	1,489	1	11
4 Aug	17.6	68	2,847	5	3,658	30	545	89	1,578	0	11
5 Aug	17.4	43	2,890	8	3,666	41	586	43	1,621	0	11
6 Aug	17.3	33	2,923	6	3,672	47	633	35	1,656	0	11
7 Aug	17.4	53	2,976	9	3,681	36	669	45	1,701	0	11
8 Aug	17.3	36	3,012	6	3,687	27	696	67	1,768	0	11
Total	569.5		32.8		40.2		7.6		19.3		0.1

Total catch: 9,174 salmon

CPUE (fish/h): 16.1

Trap efficiency: ~5.7% of total south bank sonar estimate (if catch is adjusted through 24 hours).

Note: Other species included whitefish, longnose suckers, Dolly Varden, and rainbow trout.

Table 24.—Summary of the fish wheel catch and CPUE by species for the south bank of the Yentna River, 1985–2014.

Year	Total hours	Fish wheel catch - south bank										Total catch	CPUE by species					Total CPUE
		Sockeye	%	Pink	%	Chum	%	Coho	%	King	%		Sockeye	Pink	Chum	Coho	King	
1985	883.1	5,616	35.7	8,855	56.2	521	3.3	724	4.6	35	0.2	15,751	6.4	10.0	0.6	0.8	0.0	17.8
1986	608.8	973	13.3	5,422	73.9	589	8.0	327	4.5	28	0.4	7,339	1.6	8.9	1.0	0.5	0.0	12.1
1987	824.2	2,216	32.5	3,333	48.8	966	14.1	293	4.3	20	0.3	6,828	2.7	4.0	1.2	0.4	0.0	8.3
1988	529.4	2,457	26.9	4,536	49.6	1,635	17.9	494	5.4	20	0.2	9,142	4.6	8.6	3.1	0.9	0.0	17.3
1989	818.1	3,856	27.7	7,169	51.5	1,804	12.9	1,081	7.8	23	0.2	13,932	4.7	8.8	2.2	1.3	0.0	17.0
1990	542.2	4,201	32.2	7,058	54.1	1,129	8.6	657	5.0	11	0.1	13,056	7.7	13.0	2.1	1.2	0.0	24.1
1991	445.0	5,368	42.7	3,368	26.8	877	7.0	2,936	23.4	10	0.1	12,559	12.1	7.6	2.0	6.6	0.0	28.2
1992	612.87	3,887	22.2	9,966	56.8	1,940	11.1	1,737	9.9	9	0.1	17,539	6.3	16.3	3.2	2.8	0.0	28.6
1993	446.5	8,561	34.7	12,416	50.3	1,508	6.1	2,178	8.8	25	0.1	24,688	19.2	27.8	3.4	4.9	0.1	55.3
1994	651.3	8,251	55.6	3,763	25.4	1,260	8.5	1,553	10.5	12	0.1	14,839	12.7	5.8	1.9	2.4	0.0	22.8
1995	456.3	2,737	36.3	2,335	31.0	691	9.2	1,766	23.4	11	0.1	7,540	6.0	5.1	1.5	3.9	0.0	16.5
1996	306.5	2,498	28.7	4,335	49.7	752	8.6	1,119	12.8	15	0.2	8,719	8.1	14.1	2.5	3.7	0.0	28.4
1997	318.2	5,431	79.5	672	9.8	317	4.6	397	5.8	18	0.3	6,835	17.1	2.1	1.0	1.2	0.1	21.5
1998	1,114.4	14,394	34.5	21,258	51.0	1,667	4.0	4,326	10.4	50	0.1	41,695	12.9	19.1	1.5	3.9	0.0	37.4
1999	206.3	3,790	42.4	3,213	35.9	223	2.5	1,689	18.9	34	0.4	8,949	18.4	15.6	1.1	8.2	0.2	43.4
2000	125.4	2,611	19.6	9,494	71.4	123	0.9	1,051	7.9	15	0.1	13,294	20.8	75.7	1.0	8.4	0.1	106.0
2001	157.7	2,527	27.7	4,369	47.8	460	5.0	1,755	19.2	20	0.2	9,131	16.0	27.7	2.9	11.1	0.1	57.9
2002	140.7	2,716	14.8	11,590	63.3	712	3.9	3,274	17.9	16	0.1	18,308	19.3	82.4	5.1	23.3	0.1	130.2
2003	146.7	6,095	44.9	4,927	36.3	869	6.4	1,659	12.2	15	0.1	13,565	41.5	33.6	5.9	11.3	0.1	92.5
2004	203.0	2,712	17.4	8,147	52.3	835	5.4	3,832	24.6	43	0.3	15,569	13.4	40.1	4.1	18.9	0.2	76.7
2005	277.6	2,588	26.2	2,280	23.1	571	5.8	4,433	44.9	12	0.1	9,884	9.3	8.2	2.1	16.0	0.0	35.6
2006	636.4	9,277	26.4	15,261	43.4	862	2.5	9,747	27.7	34	0.1	35,181	14.6	24.0	1.4	15.3	0.1	55.3
2007	240.4	2,998	51.8	1,410	24.4	261	4.5	1,117	19.3	2	0.0	5,788	12.5	5.9	1.1	4.6	0.0	24.1
2008	210.7	2,696	36.9	3,245	44.4	349	4.8	1,022	14.0	4	0.1	7,316	12.8	15.4	1.7	4.9	0.0	34.7
2009	629.9	6,901	9.7	55,213	77.8	2,254	3.2	6,569	9.3	33	0.0	70,970	11.0	87.7	3.6	10.4	0.1	112.7
2010	992.0	6,251	24.5	11,053	43.4	4,159	16.3	4,022	15.8	8	0.0	25,493	6.3	11.1	4.2	4.1	0.0	25.7
2011	976.2	4,348	17.1	6,550	25.8	11,310	44.6	3,164	12.5	7	0.0	25,379	4.5	6.7	11.6	3.2	0.0	26.0
2012	933.5	1,626	7.3	17,622	79.0	826	3.7	2,204	9.9	19	0.1	22,297	1.7	18.9	0.9	2.4	0.0	23.9
2013	184.1	726	8.6	6,213	73.5	176	2.1	1,321	15.6	17	0.2	8,453	3.9	33.7	1.0	7.2	0.1	45.9
2014	569.5	3,012	32.8	3,687	40.2	696	7.6	1,768	19.3	11	0.1	9,174	5.3	6.5	1.2	3.1	0.0	16.1
Historical ave.		26.5	52.7		7.8		12.9		0.1			7.7	15.2	2.2	3.7	0.0	28.8	
Historical min.		7.3	9.8		0.9		2.8		0.0			1.6	1.2	0.3	0.2	0.0	4.2	
Historical max.		79.5	79.0		44.6		44.9		0.8			41.5	87.7	11.6	23.3	0.2	130.2	
Historical SD		15.7	18.0		7.9		8.9		0.2			8.0	22.3	2.2	5.9	0.0	31.8	
Pre 1998 ave %		34.5	49.1		7.8		8.5		0.2			6.1	8.7	1.4	1.5	0.0	17.7	
1998-present		22.1	54.5		7.7		15.6		0.1			9.7	24.0	3.4	6.8	0.0	44.0	

Table 25.—Age composition of sockeye salmon sampled from fish wheels on the Yentna River, 1983–2014.

Year	% Composition by age class ^a										Other	<i>n</i>
	0.2	0.3	1.1	1.2	1.3	1.4	2.1	2.2	2.3	2.4		
1983	0.4	0.4	4.7	66.9	22.6	0.2	0.9	1.7	1.7	0.0	0.5	1,024
1984	0.2	1.6	1.3	23.7	59.6	0.1	0.3	6.5	6.7	0.0	0.0	2,253
1985	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1986	1.0	1.1	0.0	21.2	65.3	0.2	0.3	4.7	6.2	0.0	0.0	688
1987	1.3	2.4	0.9	23.3	50.6	1.0	0.0	8.6	11.7	0.0	0.0	1,089
1988	2.7	2.4	0.4	33.5	41.9	0.2	1.7	6.5	10.4	0.1	0.0	1,727
1989	4.1	6.2	0.7	20.3	53.7	0.3	0.5	5.5	8.6	0.0	0.0	1,602
1990	0.8	2.4	0.3	29.9	47.6	0.7	0.1	9.8	8.2	0.1	0.2	1,916
1991	2.1	10.6	0.1	25.2	43.6	0.1	0.1	7.1	11.0	0.1	0.1	1,509
1992	1.6	0.7	1.0	31.4	29.2	0.1	0.4	17.1	18.2	0.1	0.4	1,451
1993	1.0	4.6	0.1	32.1	35.5	0.0	0.4	11.7	14.5	0.1	0.0	1,390
1994	1.3	3.9	0.6	23.2	43.2	0.2	0.0	9.7	17.6	0.0	0.3	637
1995	2.2	5.1	0.8	19.7	51.3	0.4	0.2	8.5	11.6	0.0	0.2	507
1996	3.2	3.2	0.4	25.5	43.8	0.0	0.4	9.4	14.0	0.0	0.0	466
1997	1.1	10.5	0.1	32.4	43.7	0.1	0.1	4.7	7.2	0.0	0.1	751
1998	0.7	5.7	0.3	15.7	62.7	0.3	0.0	4.0	10.5	0.0	0.0	1,500
1999	3.6	3.4	0.0	23.4	52.0	0.9	0.0	8.6	8.1	0.0	0.0	444
2000	0.0	5.9	0.0	8.6	61.5	0.2	0.0	3.3	20.2	0.2	0.0	546
2001	0.0	3.4	0.8	21.3	47.8	0.0	0.4	8.4	17.7	0.0	0.2	475
2002	1.7	2.0	0.7	28.8	51.0	0.0	0.0	5.5	10.2	0.0	0.2	459
2003	0.5	2.5	0.1	16.1	63.6	0.4	0.5	6.0	10.3	0.0	0.0	812
2004	0.6	1.1	0.7	17.0	50.0	0.6	0.0	8.3	21.7	0.0	0.0	460
2005	0.5	4.0	1.7	22.7	54.4	0.1	0.1	6.2	10.1	0.0	0.2	823
2006	2.2	3.1	0.5	44.0	39.3	0.2	0.0	5.0	5.8	0.0	0.0	605
2007	1.9	3.6	0.3	18.9	60.9	0.0	0.6	6.3	7.4	0.0	0.1	366
2008	0.8	6.3	1.6	11.8	56.0	0.5	1.1	7.6	13.9	0.0	0.4	382
2009	2.9	2.9	1.5	33.9	31.6	0.8	2.1	17.2	7.2	0.0	0.0	664
2010	12.5	4.2	1.6	39.4	23.3	0.0	1.5	5.8	11.5	0.0	0.2	879
2011	0.4	18.1	0.9	11.3	55.9	0.2	4.3	3.9	5.1	0.0	0.0	565
2012	2.0	2.0	0.0	19.4	43.7	2.0	4.5	10.7	12.7	0.0	0.0	355
2013	2.8	2.8	5.4	22.7	52.5	0.2	4.5	4.7	4.3	0.0	0.0	422
2014	1.9	1.7	0.3	39.4	33.3	0.8	0.0	12.4	10.2	0.0	0.0	363
Ave. (1983–13)	1.8	4.1	0.9	26.9	47.3	0.3	0.7	7.6	10.4	0.0	0.1	839

Table 26.—Average lengths by age class of sockeye salmon sampled from the Yentna River fish wheels, 1991–2014.

Year	Age class	Male		Female		Both		Male-Female
		Length (mm)	n	Length (mm)	n	Length (mm)	n	
1991	1.2	460	253	484	130	468	383	1.9:1
1992		444	360	470	115	450	475	3.1:1
1993		465	279	484	167	472	446	1.7:1
1994		468	107	484	41	473	148	2.6:1
1995		460	58	472	42	465	100	1.4:1
1996		463	78	469	41	465	119	1.9:0
1997		479	110	479	133	479	243	0.8:1
1998		485	104	486	132	486	236	0.8:1
1999		469	56	484	48	476	104	1.2:1
2000		462	35	458	12	461	47	2.9:1
2001		477	53	490	48	483	101	1.1:1
2002		486	76	495	56	490	132	1.4:1
2003		473	77	486	54	478	131	1.4:1
2004		466	53	490	25	474	78	2.1:1
2005		456	125	466	62	459	187	2.0:1
2006		485	134	487	132	486	266	1.0:1
2007		455	43	483	26	466	69	1.7:1
2008		456	40	482	5	459	45	8.0:1
2009		472	139	488	86	478	225	1.6:1
2010		462	208	478	138	468	346	1.5:1
2011		452	35	497	29	472	64	1.2:1
2012		475	40	478	29	476	69	1.4:1
2013		446	65	480	31	457	96	2.1:1
2014		458	96	470	47	462	143	2.0:1
Average (1986-2013)		464	134	478	82	469	215	1.6:1
1991	1.3	562	301	542	356	551	657	0.8:1
1992		546	188	543	242	544	430	0.8:1
1993		561	228	549	266	554	494	0.9:1
1994		596	133	561	142	578	275	0.9:1
1995		568	124	545	136	556	260	0.9:1
1996		589	107	568	97	579	204	1.1:1
1997		585	155	555	173	569	328	0.9:1
1998		562	453	538	487	550	940	0.9:1
1999		581	135	553	96	569	231	1.4:1
2000		600	180	568	156	585	336	1.2:1
2001		586	111	555	116	570	227	1.0:1
2002		596	113	561	121	578	234	0.9:1
2003		576	270	548	246	563	516	1.1:1
2004		574	93	553	137	562	230	0.7:1
2005		568	222	546	226	557	448	1.0:1
2006		567	99	554	139	559	238	0.7:1
2007		575	109	552	114	563	223	1.0:1
2008		571	99	555	115	563	214	0.9:1
2009		580	92	557	118	567	210	0.8:1
2010		569	79	548	126	556	205	0.6:1
2011		577	166	561	150	570	316	1.1:1
2012		581	77	555	78	568	155	1:1
2013		572	129	545	92	561	221	1.4:1
2014		564	50	560	71	561	121	0.7:1
Average (1986-2013)		575	187	552	204	563	391	0.9:1

-continued-

Table 26.–Page 2 of 2.

Year	Age class	Male		Female		Both		Male-Female
		Length (mm)	n	Length (mm)	n	Length (mm)	n	
1991	2.2	478	57	477	50	478	107	1.1:1
1992		452	181	471	53	456	234	3.4:1
1993		476	93	487	69	481	162	1.3:1
1994		487	30	490	32	488	62	0.9:1
1995		472	23	488	20	479	43	1.2:1
1996		472	21	498	23	486	44	0.9:1
1997		497	15	460	20	475	35	0.8:1
1998		482	36	487	24	484	60	1.5:1
1999		483	16	491	22	487	38	0.7:1
2000		470	10	477	8	473	18	1.3:1
2001		487	19	482	21	485	40	0.9:1
2002		482	16	486	9	483	25	1.8:1
2003		472	23	486	26	480	49	0.9:1
2004		474	24	486	14	478	38	1.7:1
2005		462	29	488	22	473	51	1.3:1
2006		500	17	490	13	496	30	1.3:1
2007		471	8	493	15	486	23	0.5:1
2008		468	19	495	10	477	29	1.9:1
2009		492	73	495	41	493	114	1.8:1
2010		468	26	487	25	477	51	1.0:1
2011		474	15	488	7	479	22	2.1:1
2012		474	17	483	21	479	38	0.8:1
2013		505	8	468	12	483	20	0.7:1
2014		477	27	485	18	480	45	1.5:1
Average (1986-2013)		473	38	483	30	478	68	1.3:1
1991	2.3	561	78	536	86	547	164	0.9:1
1992		564	123	538	126	551	249	1.0:1
1993		562	74	544	128	550	202	0.6:1
1994		600	56	561	56	580	112	1.0:1
1995		578	25	544	34	559	59	0.7:1
1996		585	31	558	34	571	65	0.9:1
1997		575	34	548	20	565	54	1.7:1
1998		558	82	534	76	547	158	1.1:1
1999		585	16	546	20	563	36	0.8:1
2000		597	55	563	55	580	110	1.0:1
2001		575	34	552	50	561	84	0.7:1
2002		589	21	551	26	568	47	0.8:1
2003		562	50	543	34	555	84	1.5:1
2004		579	41	551	59	560	100	0.7:1
2005		557	32	537	51	545	83	0.6:1
2006		562	13	553	22	556	35	0.6:1
2007		568	12	544	15	555	27	0.8:1
2008		565	26	535	27	550	53	1.0:1
2009		560	18	548	30	553	48	0.6:1
2010		559	39	545	62	551	101	0.6:1
2011		564	14	544	15	554	29	0.9:1
2012		571	23	540	22	556	45	1:1
2013		581	9	547	9	564	18	1:1
2014		579	22	557	15	570	37	1.5:1
Average (1986-2013)		573	44	547	50	559	94	0.9:1
2014 summary (all ages)		501	206	524	157	511	363	1.3:1

Table 27.—Index (ground or aerial counts) and weir counts of salmon in various northern district spawning areas in 2014.

Water body-method-source	Number of fish observed or estimated				
	Sockeye	Pink	Chum	Coho	Chinook
Alexander Creek (aerial survey, ADF&G-SF)	0	0	0	0	911
Birch Creek (aerial survey, ADF&G, SF)	0	0	0	398	0
Cache Creek (aerial survey ADF&G, SF)	0	0	0	0	475
Chelatna Lake (weir, ADF&G CF)	26,374	10,061	12	20	50
Chuitna River (aerial survey, ADF&G CF)	0	0	0	0	1,398
Chulitna River (aerial survey, ADF&G-SF)	0	0	0	0	1,011
Clear Creek (aerial survey, ADF&G-SF)	0	0	0	0	1,390
Coal Creek (aerial survey, ADF&G, SF)	0	0	0	0	411
Cottonwood Creek (foot survey, ADF&G, SF)	0	0	0	1,698	0
Deception Creek (aerial survey, ADF&G SF)	0	0	0	0	688
Deshka River (weir, ADF&G SF)	26	78,111	110	11,578	16,335
Fish Creek (weir, ADF&G, SF)	43,915	9,198	107	10,283	6
Goose Creek (aerial survey, ADF&G, SF)	0	0	0	0	232
Indian River (aerial survey, ADF&G, SF)	0	0	0	0	558
Jim Creek, Upper (foot survey, ADF&G, SF)	0	0	0	618	0
Judd Lake (weir, ADF&G CF)	22,229	747	51	14	9
Kashwitna River (aerial survey, ADF&G, SF)	0	0	0	0	88
Lake Creek (aerial survey, ADF&G-SF)	0	0	0	0	3,506
Larson L (weir ADF&G CF)	12,430	33	0	0	0
Lewis River (aerial survey, ADF&G-SF)	0	0	0	0	61
Little Susitna (weir/aerial survey, ADF&G-SF)	900	16,001	21,733	24,211	3,135
Little Willow Creek (aerial survey, ADF&G-SF)	0	0	0	0	684
McRoberts Creek (foot survey, ADF&G, SF)	0	0	0	122	0
Montana Creek (aerial survey, ADF&G, SF)	0	0	0	0	953
Moose Creek (aerial survey, ADF&G, SF)	0	0	0	0	299
Peters Creek (foot survey, ADF&G, SF)	0	0	0	0	1,443
Portage Creek (aerial survey, ADF&F, SF) ^a	0	0	0	0	2,812
Prairie Creek (aerial survey, ADF&G-SF)	0	0	0	0	0
Question Creek (aerial survey, ADF&G, SF)	0	0	0	251	0
Sheep Creek (survey, ADF&G, SF)	0	0	0	0	262
Talachulitna River (aerial, ADF&G-CF)	0	0	0	0	2,256
Theodore River (aerial, ADF&G-CF)	0	0	0	0	312
Willow Creek (aerial survey, ADF&G, SF)	0	0	0	0	1,335
Total index	105,874	114,151	22,013	49,193	40,620
Yentna index (Chelatna + Judd)	48,603				
Combined Susitna index (SEG = Chelatna + Judd + Larson)	61,033				

^a No counts conducted due to poor water visibility.

Table 28.—Species composition from drift gillnets along the north bank of the Yentna River, 2014.

Date	Hours	North bank						Total salmon	
		Sockeye	Pink	Chum	Coho	Chinook	Other	Total	Cum
7 Jul	1.50	5	0	0	0	1	0	6	6
8 Jul	1.52	9	1	0	0	0	0	10	16
9 Jul	1.48	9	1	1	1	0	0	12	28
10 Jul	1.52	8	1	1	0	0	0	10	38
11 Jul	1.50	6	1	0	0	0	0	7	45
12 Jul	1.50	2	0	0	0	0	0	2	47
13 Jul	1.50	6	0	2	0	0	0	8	55
14 Jul	1.52	5	1	3	1	0	0	10	65
15 Jul	1.53	7	10	2	1	0	0	20	85
16 Jul	1.50	13	15	1	1	0	0	30	115
17 Jul	1.50	19	19	4	0	0	0	42	157
18 Jul	1.50	13	28	3	2	0	0	46	203
19 Jul	1.47	19	22	11	1	0	0	53	256
20 Jul	1.48	24	45	11	5	0	0	85	341
21 Jul	1.58	15	36	16	4	0	0	71	412
22 Jul	1.52	20	26	14	9	0	0	69	481
23 Jul	1.50	22	30	15	9	0	0	76	557
24 Jul	1.50	15	21	15	4	0	0	55	612
25 Jul	1.53	13	9	15	15	0	0	52	664
26 Jul	1.52	12	14	18	18	0	0	62	726
27 Jul	1.57	4	5	13	16	0	0	38	764
28 Jul	1.50	7	4	9	17	0	0	37	801
29 Jul	1.50	12	10	17	19	0	0	58	859
30 Jul	2.33	2	3	11	5	0	0	21	880
31 Jul	1.50	7	1	11	4	0	0	23	903
1 Aug	1.50	6	1	6	9	0	0	22	925
2 Aug	1.48	5	0	21	20	0	0	46	971
3 Aug	1.50	0	0	16	27	0	0	43	1014
4 Aug	1.50	4	0	14	4	0	0	22	1036
5 Aug	1.50	1	0	6	0	0	0	7	1043
6 Aug	1.50	0	0	10	2	0	0	12	1055
7 Aug	1.50	2	1	9	3	0	0	15	1070
8 Aug	1.00	0	0	1	4	0	0	5	1075
Total	50.05	292	305	276	201	1	0	1,075	CPUE
Gillnet %		27.2%	28.4%	25.7%	18.7%	0.1%	—	—	21.5
FW total	565.2	775	5,758	998	948	34	—	8,513	15.1
FW %		9.1%	67.6%	11.7%	11.1%	0.4%	—	—	—

Note: Comparison summary with the north bank fish wheel (FW) catch is provided at the bottom of the table.

Table 29.—Species composition from drift gillnets along the south bank of the Yentna River, 2014.

Date	Hours	South bank						Total salmon	
		Sockeye	Pink	Chum	Coho	Chinook	Other	Total	Cum
7 Jul	1.50	2	0	0	0	0	0	2	2
8 Jul	1.55	3	0	0	0	0	0	3	5
9 Jul	1.47	3	0	0	0	1	0	4	9
10 Jul	1.50	5	1	0	0	0	0	6	15
11 Jul	1.50	2	1	0	0	0	0	3	18
12 Jul	1.50	2	0	1	0	0	0	3	21
13 Jul	1.50	7	1	0	1	0	0	9	30
14 Jul	1.50	7	2	0	2	0	0	11	41
15 Jul	1.50	22	3	0	2	0	0	27	68
16 Jul	1.50	7	6	3	0	0	0	16	84
17 Jul	1.50	12	8	6	0	0	0	26	110
18 Jul	1.48	14	24	1	0	0	0	39	149
19 Jul	1.50	5	23	2	3	0	0	33	182
20 Jul	1.47	25	19	5	6	0	0	55	237
21 Jul	1.47	33	24	10	11	0	0	78	315
22 Jul	1.53	10	22	7	15	0	0	54	369
23 Jul	1.50	13	19	6	18	0	0	56	425
24 Jul	1.50	11	17	16	10	0	0	54	479
25 Jul	1.50	15	7	7	23	0	0	52	531
26 Jul	1.50	22	6	4	30	0	0	62	593
27 Jul	1.50	10	5	5	22	0	0	42	635
28 Jul	1.50	4	4	4	12	0	0	24	659
29 Jul	1.50	11	1	13	23	0	0	48	707
30 Jul	1.53	5	2	6	9	0	0	22	729
31 Jul	1.52	7	2	8	4	0	0	21	750
1 Aug	1.50	6	0	6	25	0	0	37	787
2 Aug	1.50	4	1	13	26	0	0	44	831
3 Aug	1.70	4	0	5	26	0	0	35	866
4 Aug	1.50	2	0	8	13	0	0	23	889
5 Aug	1.50	3	0	5	8	0	0	16	905
6 Aug	1.50	2	0	7	5	0	0	14	919
7 Aug	1.58	3	0	1	4	0	0	8	927
8 Aug	1.00	2	0	3	6	0	0	11	938
Total	49.30	283	198	152	304	1	0	938	CPUE
Gillnet %		30.2%	21.1%	16.2%	32.4%	0.1%	—	—	19.0
FW total	569.5	3,012	3,687	696	1,768	11	—	9,174	16.1
FW %		32.8%	40.2%	7.6%	19.3%	0.1%	—	—	—

Note: Comparison summary with the south bank fish wheel (FW) catch is provided at the bottom of the table.

Table 30.—Gillnet catches by bank.

Bank	Mesh (cm)	Hours	Total net catch by species/mesh						Total
			Sockeye	Pink	Chum	Coho	Chinook	Other	
North	12.1	17.5	122	109	49	69	0	0	349
	13.0	16.3	107	139	94	88	0	0	428
	15.2	16.3	64	57	133	44	1	0	298
	Total	50.0	293	305	276	201	1	0	1,075
South	12.1	16.4	122	97	20	110	1	0	349
	13.0	16.5	91	74	56	115	0	0	336
	15.2	16.4	71	27	76	79	0	0	253
	Total	49.3	284	198	152	304	1	0	938
Both	12.1	33.9	244	206	69	179	1	0	698
	13.0	32.7	198	213	150	203	0	0	764
	15.2	32.7	135	84	209	123	1	0	551
	Total	99.3	577	503	428	505	2	0	2013
% of Catch/mesh size									
North	12.1	—	34.9%	31.3%	14.1%	19.8%	—	—	100%
	13.0	—	25.0%	32.5%	22.0%	20.6%	—	—	100%
	15.2	—	21.5%	19.1%	44.6%	14.8%	—	—	100%
	Total	—	27.2%	28.4%	25.7%	18.7%	—	—	100%
South	12.1	—	35.0%	27.8%	5.7%	31.5%	—	—	100%
	13.0	—	27.1%	22.0%	16.7%	34.2%	—	—	100%
	15.2	—	28.1%	10.7%	30.0%	31.2%	—	—	100%
	Total	—	30.3%	21.1%	16.2%	32.4%	—	—	100%
Both	12.1	—	34.9%	29.5%	9.9%	25.7%	—	—	100%
	13.0	—	25.9%	27.9%	19.6%	26.6%	—	—	100%
	15.2	—	24.5%	15.2%	37.9%	22.3%	—	—	100%
	Total	—	28.6%	25.0%	21.3%	25.1%	—	—	100%
CPUE/mesh size								R sq	Mesh sizes
North	12.1	—	7.0	6.2	2.8	4.0	—	0.4434	12.1:13.0
	13.0	—	6.6	8.5	5.8	5.4	—	0.0741	13.0:15.2
	15.2	—	3.9	3.5	8.2	2.7	—	0.3571	12.1:15.2
	Total	—	5.8	6.1	5.5	4.0	—	—	
South	12.1	—	7.4	5.9	1.2	6.7	—	0.6222	12.1:13.0
	13.0	—	5.5	4.5	3.4	7.0	—	0.0888	13.0:15.2
	15.2	—	4.3	1.6	4.6	4.8	—	0.0301	12.1:15.2
	Total	—	5.8	4.0	3.1	6.2	—	—	
Both	12.1	—	7.2	6.1	2.0	5.3	—	0.7743	12.1:13.0
	13.0	—	6.0	6.5	4.6	6.2	—	0.9573	13.0:15.2
	15.2	—	4.1	2.6	6.4	3.8	—	0.6472	12.1:15.2
	Total	—	5.8	5.1	4.3	5.1	—	0.2959	NB:SB

Catch similarity between same size mesh, R^2 values NB:SB

12.1" = 0.5803 13.0" = 0.1009 15.2" = 0.0787

Note: Total gill net catch (top), percentage by species by mesh size and comparison of species composition between mesh sizes and bank.

Table 31.—Kenai (top) and Kasilof (bottom) rivers observer count variability.

Kenai R. crew	File size ^a	n ^b	Observer: 1	2	3	4	5	2014 ave ^c	SD	Orig ^d	
Average	<100	3	68	62	65	68	70	67	3.1	68	
	100–199	1	137	137	138	137	139	138	0.9	140	
	200–299	2	235	236	234	228	237	234	3.7	237	
	0–299	6	135	132	134	133	137	134	2.0	136	
	R ²		0.9982	0.9959	0.9988	0.9963	0.9995	—	—	0.9972	
	300–399	2	379	371	364	370	354	367	9.3	375	
	400–499	4	466	449	435	442	430	444	13.9	464	
	500–599	5	575	497	569	552	526	544	32.2	559	
	300–599	11	500	457	483	479	460	476	17.6	491	
	R ²		0.7844	0.8353	0.9206	0.9524	0.9397	—	—	0.8572	
Average	600–699	6	665	615	678	661	615	647	29.8	690	
	700–799	3	783	671	779	814	705	751	60.0	756	
	800–899	3	919	828	960	866	793	874	67.5	813	
	600–899	12	758	682	774	740	682	727	43.0	737	
	R ²		0.9222	0.8534	0.9760	0.7811	0.9708	—	—	0.5496	
	Average	>900	6	1,179	1,132	1,223	1,280	1,121	1,180	65.8	1,144
	R ²		0.7796	0.8228	0.9905	0.8445	0.9603	—	—	0.9589	
	Average count ^e	35	642	594	650	604	594	624	27.0	627	
	Diff from average		18	-30	26	-20	-30	—	—	3.3	
	R ² average ^f		0.9848	0.9855	0.9954	0.9571	0.9923	—	—	0.9750	

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Kasilof R. crew	File size	<i>n</i>	Observer 1	2	3	2014 ave	SD	Orig
Average	<99	11	55	54	56	55	1.0	55
R^2			0.9986	0.9976	0.9979	–	–	0.9988
Average	100–199	8	149	147	151	149	2.1	149
R^2			0.9964	0.9978	0.9953	–	–	0.9926
Average	>200	5	400	405	402	403	2.6	403
R^2			0.9999	0.9999	0.9998	–	–	0.9944
Average count	All	24	158	158	160	159	1.0	159
Diff from average			–0.8	–0.3	1.1	–	–	0
R^2 average			0.9999	0.9998	0.9998	–	–	0.9989

^a Range of the number of fish per DIDSON file.^b Number of files containing the same range of fish abundance.^c 2014 Average.^d Original average.^e Average count for all comparison files.^f The R^2 values are crew averages compared to observer counts and original counts made in 2012–2013.

Table 32.—Late run sockeye salmon weir and ground survey counts in 4 index streams in the Kenai River drainage, 1969–2014.

Year	Ptarmigan Creek		Quartz Creek		Hidden Lake Weir	Russian River		Area index
			Weir	Ground		Above weir	Below weir	
	Ground					Weir	Ground	
1969	ND		ND	487	500	28,872	1,100	30,959
1970	ND		ND	200	323	26,200	222	26,945
1971	45		ND	808	1,958	54,421	11,442	68,674
1972	ND		ND	ND	4,956	79,115	7,113	91,184
1973	1,041		ND	3,173	690	25,068	6,680	36,652
1974	558		ND	288	1,150	24,904	2,210	29,110
1975	186		ND	1,068	1,375	31,961	690	35,280
1976	505		ND	3,372	4,860	31,939	3,470	44,146
1977	1,513		ND	3,037	1,055	21,362	17,090	44,057
1978	3,529		ND	10,627	4,647	34,334	18,330	71,467
1979	532		ND	277	5,762	87,852	3,920	98,343
1980	5,752		ND	7,982	27,448	83,984	3,220	128,386
1981	1,421		ND	5,998	15,939	44,523	4,160	72,041
1982	7,525		70,540	ND	9,790	30,790	45,000	163,645
1983	9,709		73,345	ND	11,297	33,734	44,000	172,085
1984	18,000		37,659	ND	27,784	92,659	3,000	179,102
1985	26,879		ND	ND	24,784	136,969	8,650	197,282
1986	ND		ND	ND	17,530	40,281	15,230	73,041
1987	14,187		ND	45,400	43,487	53,932	76,530	233,536
1988	31,696		ND	ND	50,907	42,476	30,360	155,439
1989	3,484		ND	ND	7,770	138,377	28,480	178,111
1990	2,230		ND	ND	77,959	83,434	11,760	175,383
1991	4,628		ND	ND	35,576	78,175	22,267	105,070
1992	3,147		ND	ND	32,912	62,584	4,980	103,623
1993	ND		ND	ND	11,582	99,259	12,258	123,099
1994	1,077		ND	ND	6,086	122,277	15,211	144,651
1995	ND		ND	1,372	7,542	61,982	12,479	83,375
1996	ND		ND	4,181	55,256	34,691	31,601	125,729
1997	ND		ND	27,660	56,053	65,905	11,337	160,955
1998	ND		ND	11,130	67,727	113,480	19,593	211,930
1999	ND		ND	3,951	49,406	139,863	19,514	212,734
2000	ND		ND	1,389	45,685	56,580	13,930	117,584
2001	ND		ND	4,792	42,462	74,964	17,044	139,262
2002	ND		ND	66,294	71,983	62,115	6,858	140,956
2003	ND		ND	19,106	11,734	157,469	27,474	215,783
2004	4,428		ND	13,225	18,172	110,244	30,458	176,527
2005	3,036		ND	6,580	13,000 ^a	59,473	29,048	98,137
2006	3,461		ND	28,335	38,535	89,160	18,452	177,943
2007	1,938		ND	38,954	16,734	53,068	4,504	115,198
2008	5,530		ND	16,622	15,214	46,638	9,750	93,754
2009	3,980		ND	11,262	11,011	80,088	10,740	117,081
2010	2,184		ND	5,098	41,503	38,848	16,656	104,289
2011	ND		ND	8,779	17,771	41,529	35,415	103,494
2012	1,166		ND	14,093	30,466	54,911	25,471	126,107
2013	3,648		ND	8,457	21,157	31,573	18,972	83,807
2014	2,685		ND	14,943	21,838	52,277	10,659	102,402

^a Count is incomplete, hole discovered in weir on August 11.

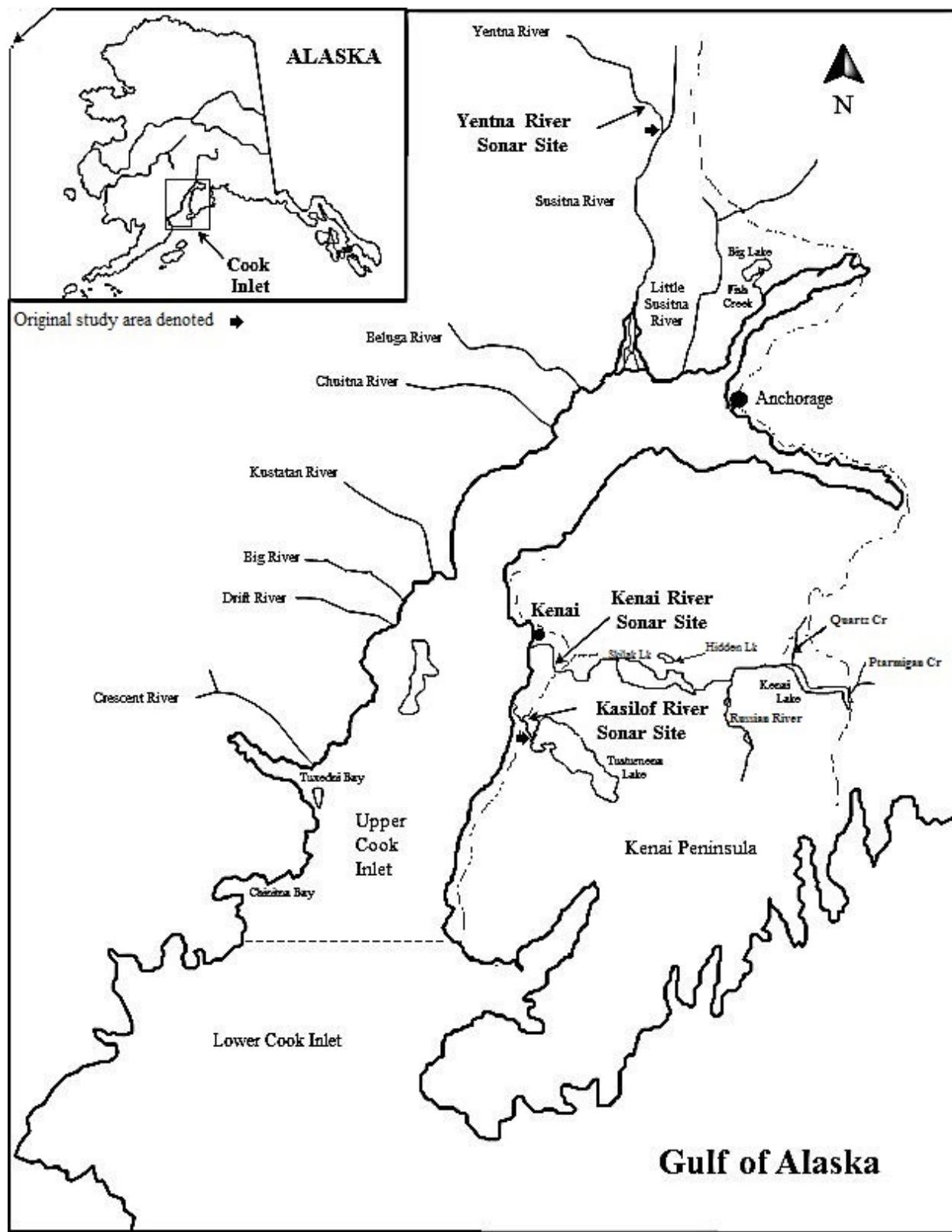


Figure 1.—Map of Upper Cook Inlet, Alaska, showing the locations of the Kenai, Kasilof and Yentna rivers escapement projects.

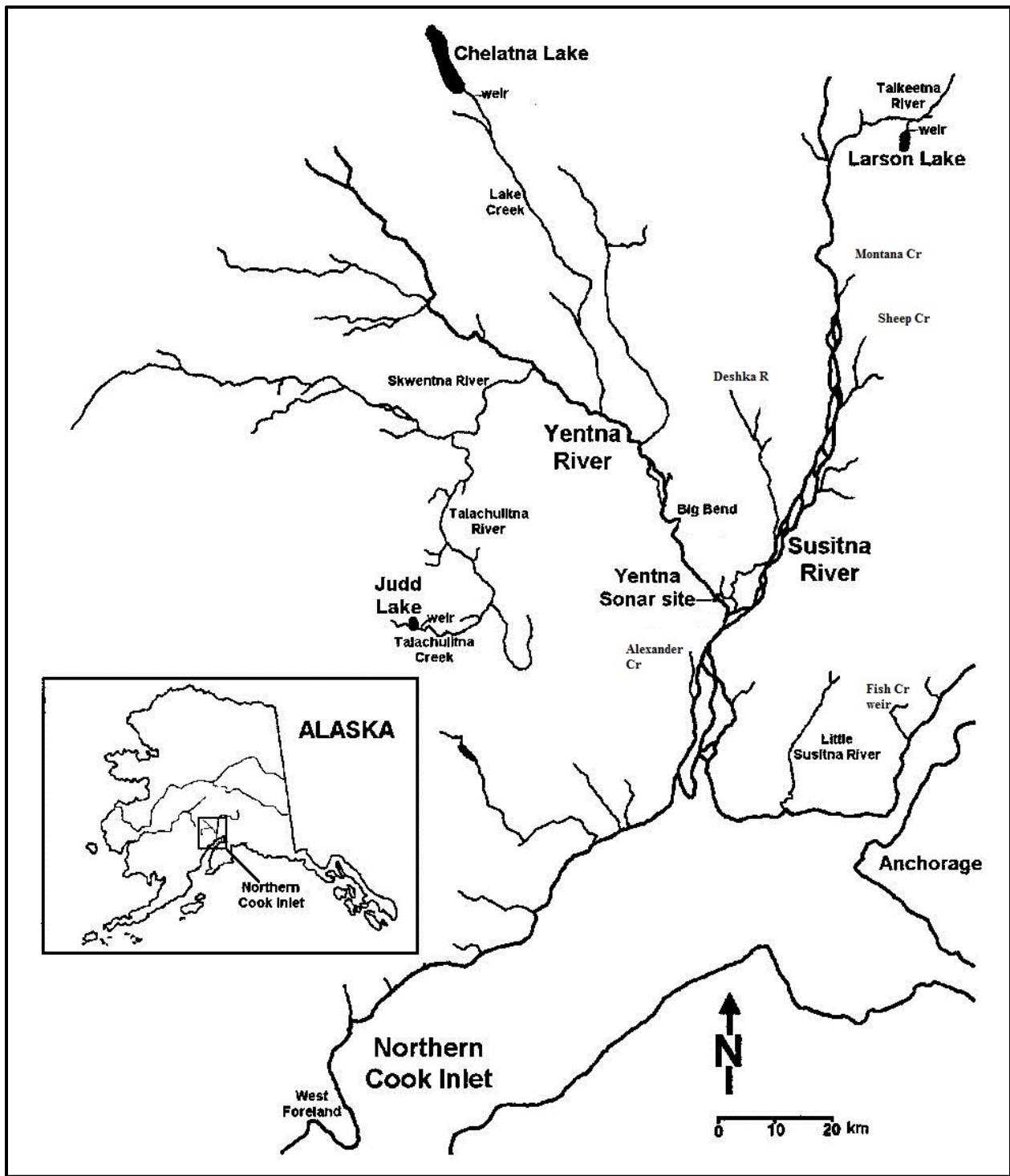


Figure 2.—Map of Susitna Valley, Alaska, showing Chelatna, Judd and Larson Lake weirs, which replaced Yentna River sonar in providing salmon escapement estimates for the Susitna River drainage.

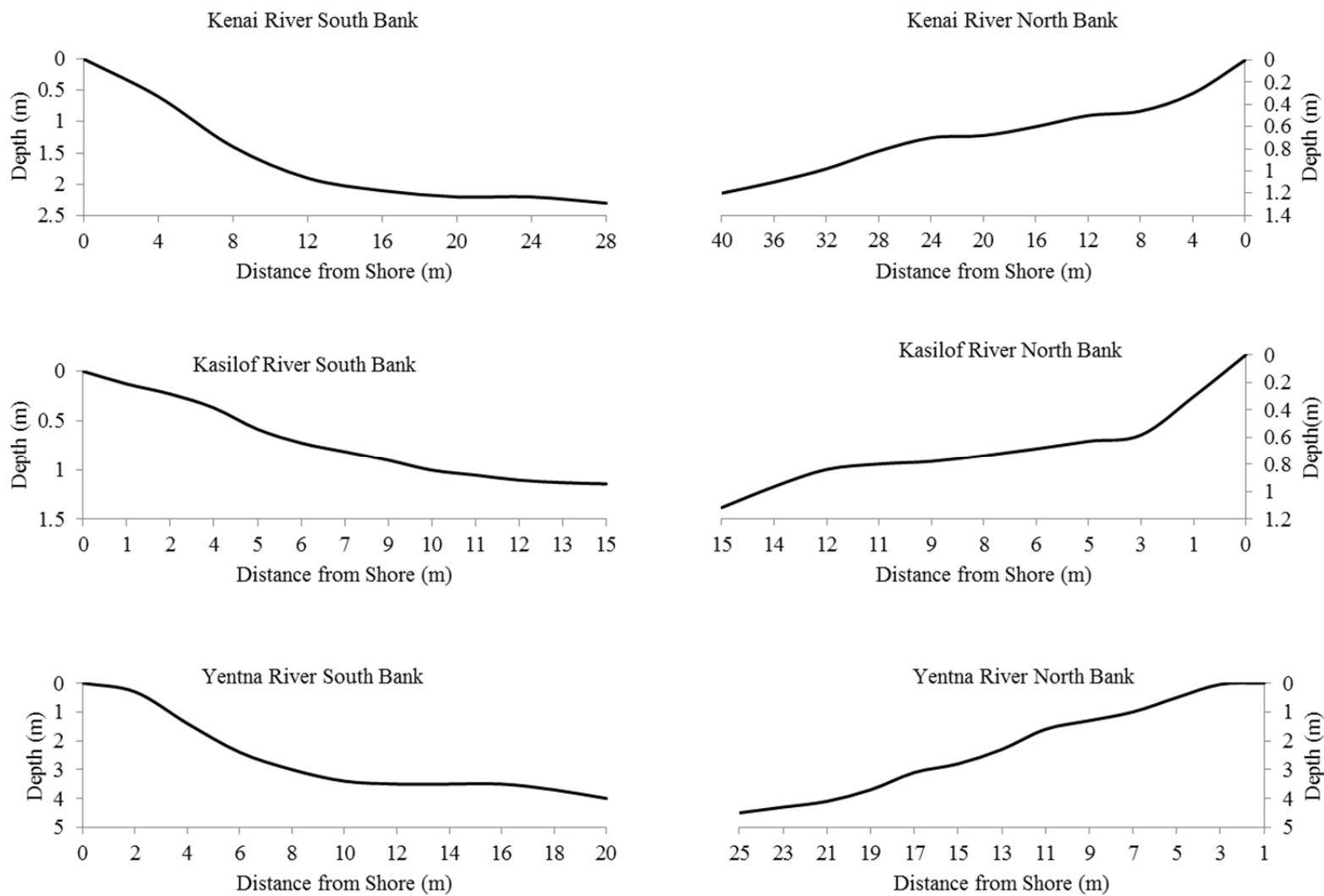


Figure 3.—River bottom profiles of the Kenai (top), Kasilof (middle) and Yentna river (bottom) sonar sites, 2014.

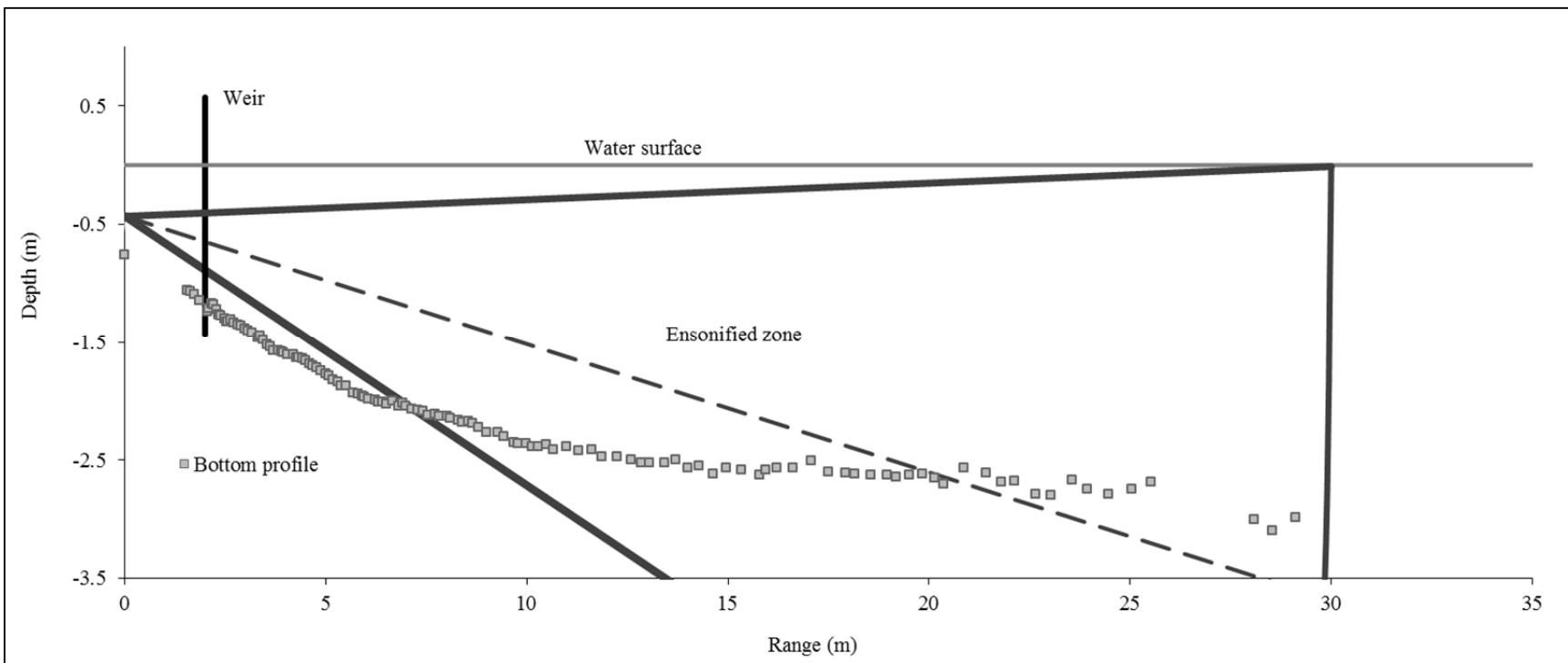


Figure 4.—Representative river bottom profile and DIDSON ensonified zone.



Figure 5.—Typical fish wheel installation, Kenai River fish wheel and weir.

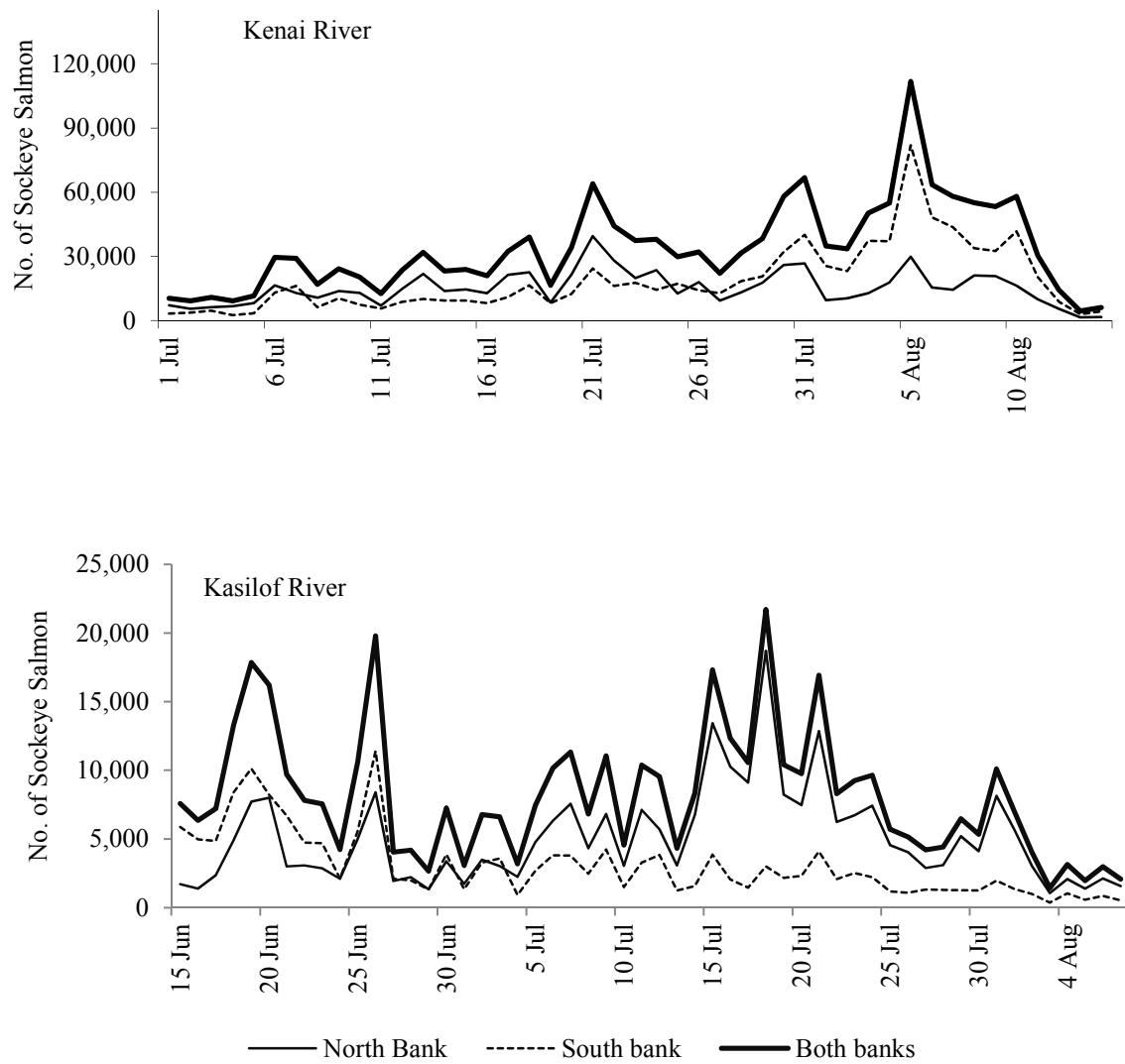


Figure 6.—Total daily escapement estimates by bank for sockeye salmon in the Kenai (top) and Kasilof rivers (bottom), 2014.

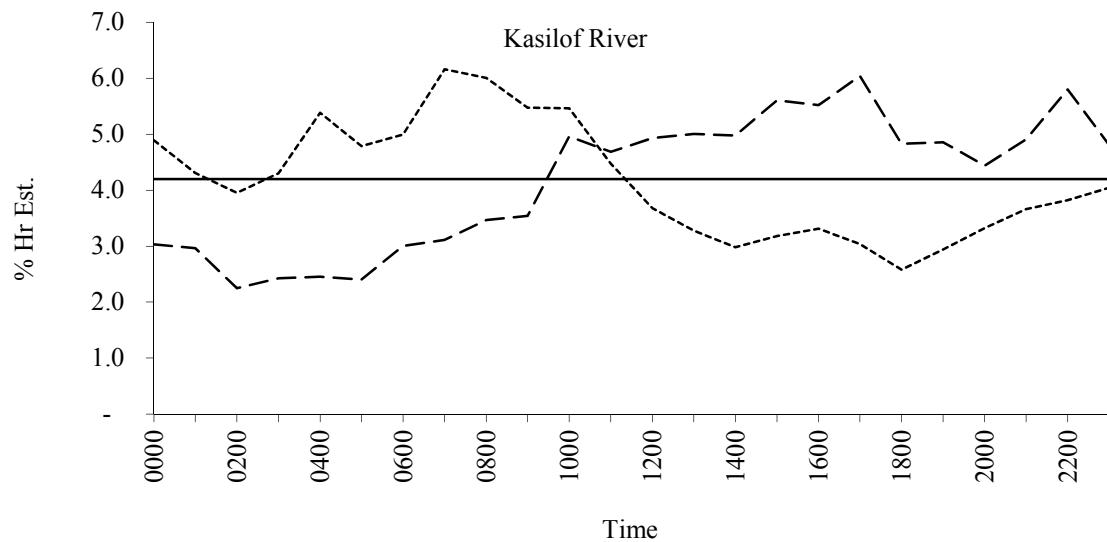
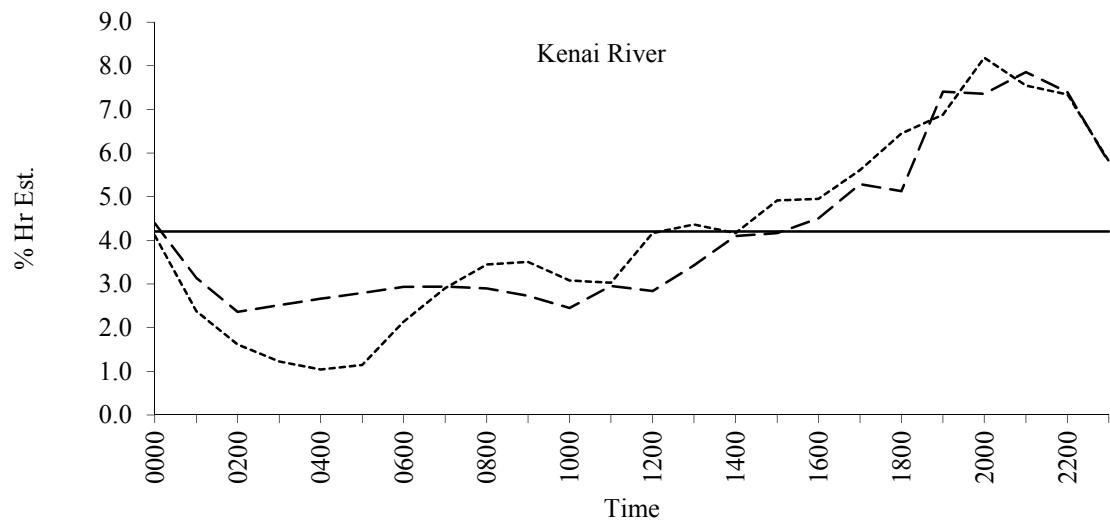


Figure 7.—Mean hourly salmon migration rates by bank in the Kenai (top) and Kasilof (bottom) rivers, 2014.

Note: The straight line represents a (hypothetical) constant passage rate over a 24 hour period.

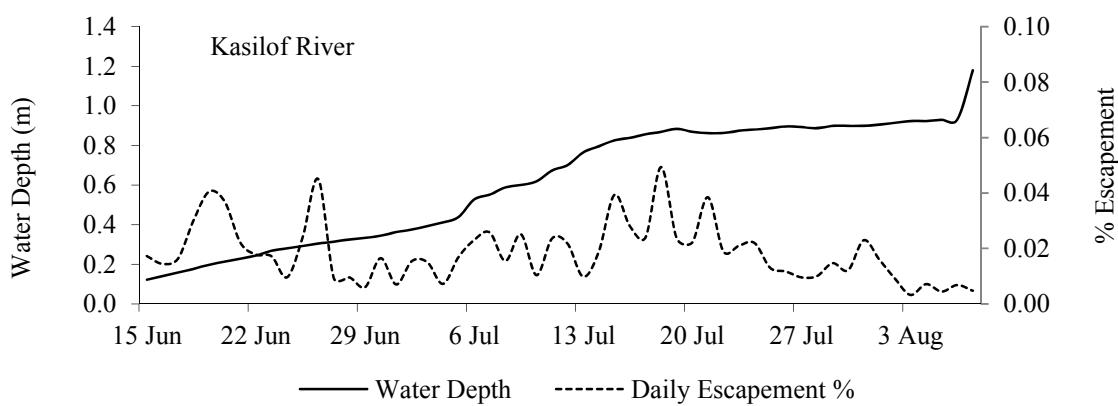
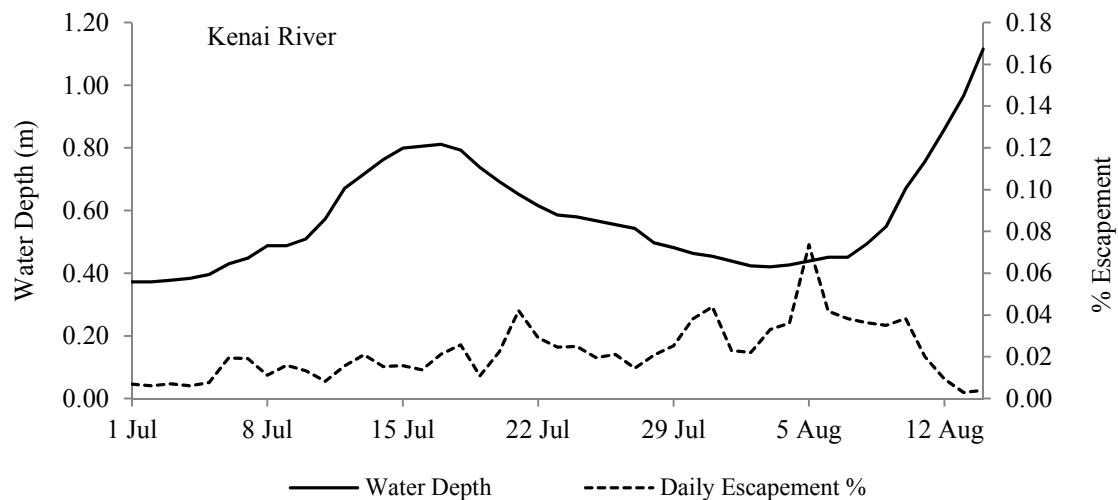


Figure 8.—Daily water level fluctuations (solid line) for the Kenai (top) and Kasilof (bottom) rivers, 2014.

Note: Daily escapement timing for sockeye salmon (dotted line) is included for comparison.

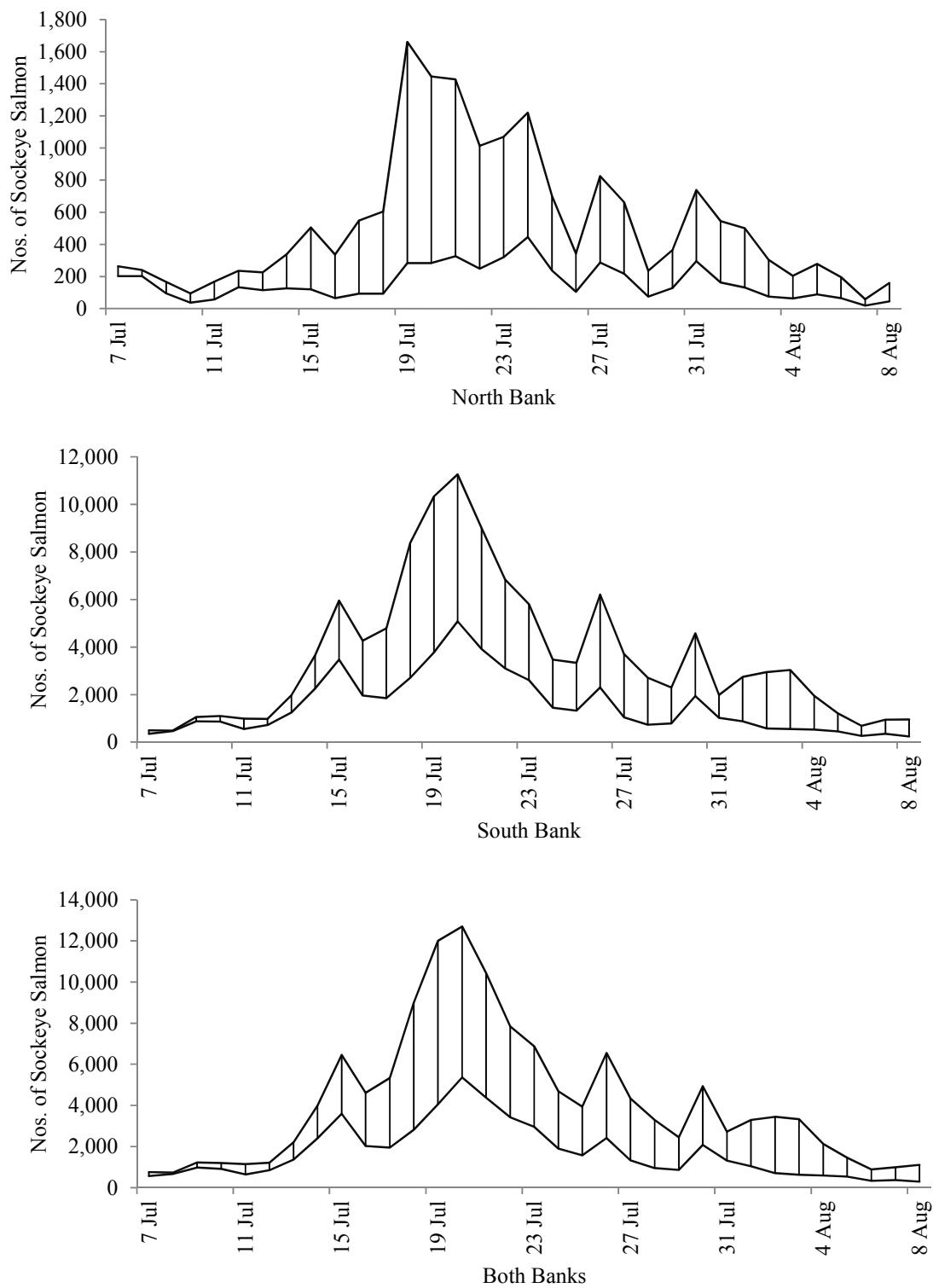


Figure 9.—Daily ranges in migratory timing of sockeye salmon in the Yentna River, 2014.

Note: The top line represents a maximum migration estimate and the bottom line represents a minimum.

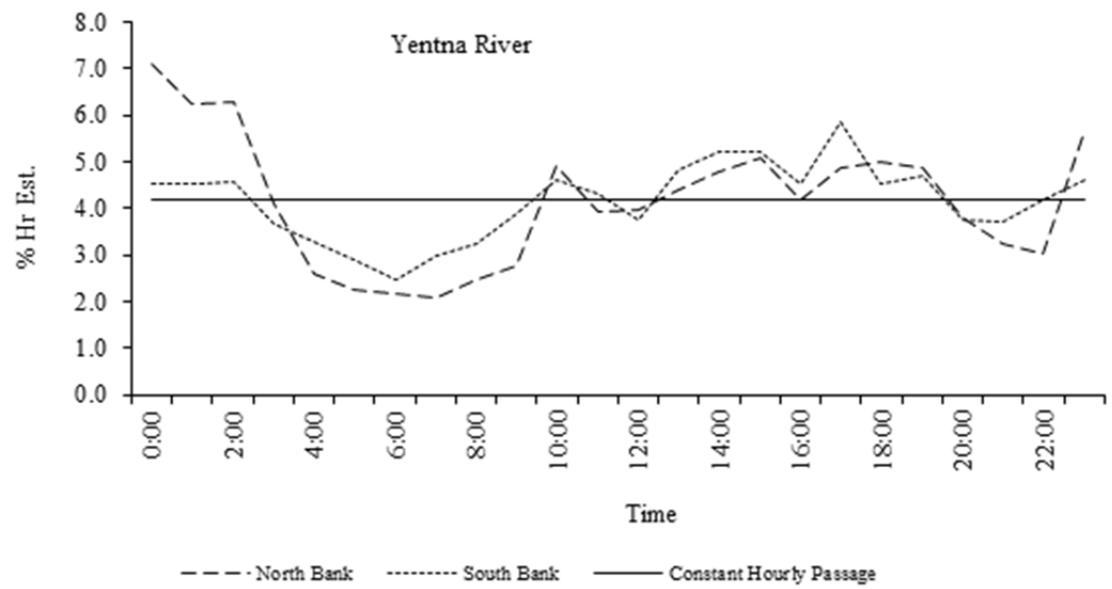


Figure 10.—Mean hourly salmon passage rates by bank in the Yentna River, 2014.

Note: The straight line represents a (hypothetical) constant passage rate for 24 hours.

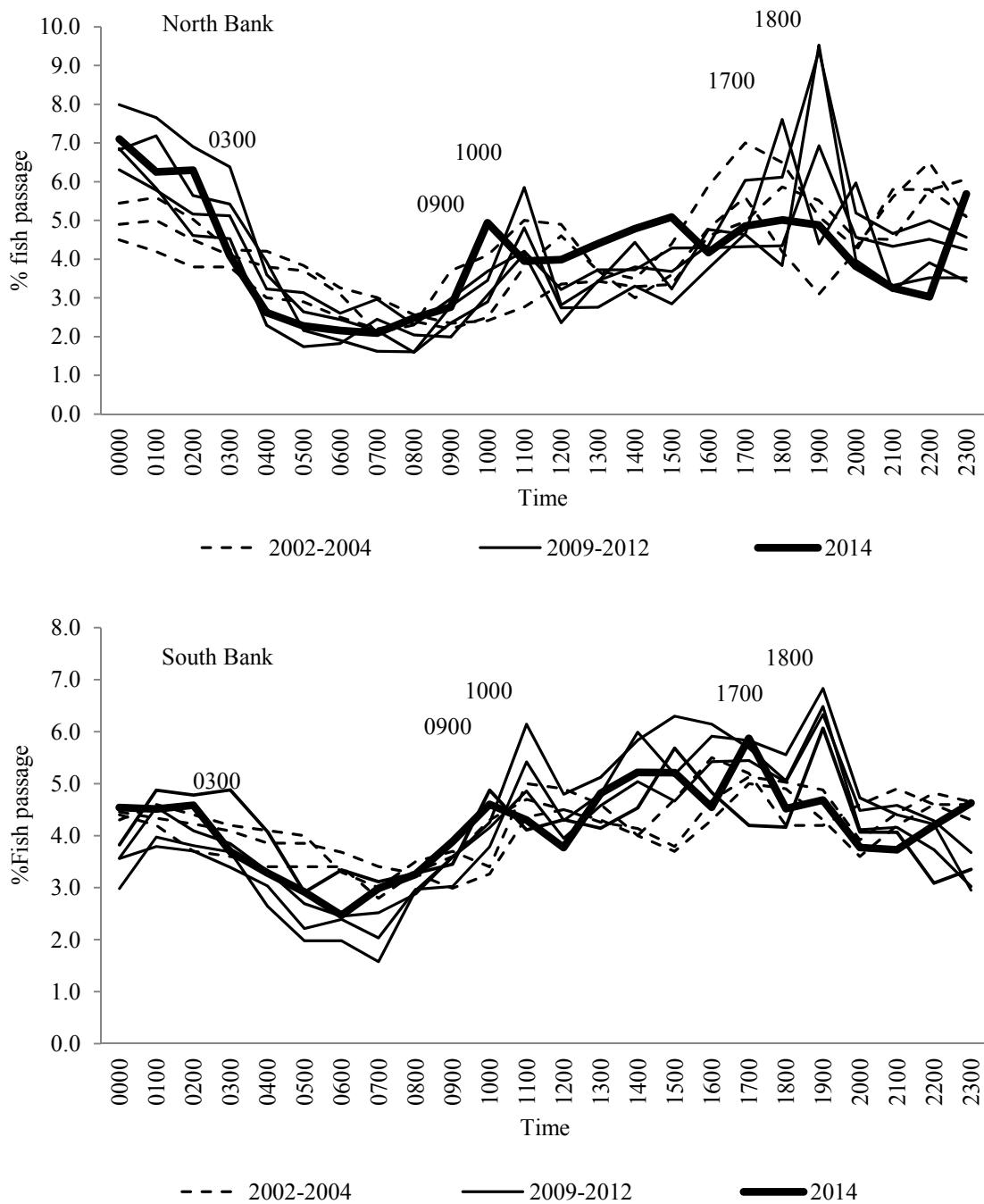


Figure 11.—Charts showing temporary spikes in fish (all species) passage when fish wheels were shut down (~2300–0300, 0900–1000 and 1700–1800) along the north (top) and south (bottom) banks of the Yentna River. Shut off times from 2009 to 2012 were generally one hour later.

Note: Includes hourly percent fish passages from 2002 to 2004 when fish wheels operated 4 to 6 hours a day and fish passages from 2009 to 2012 when they operated 16 to 18 hours a day.

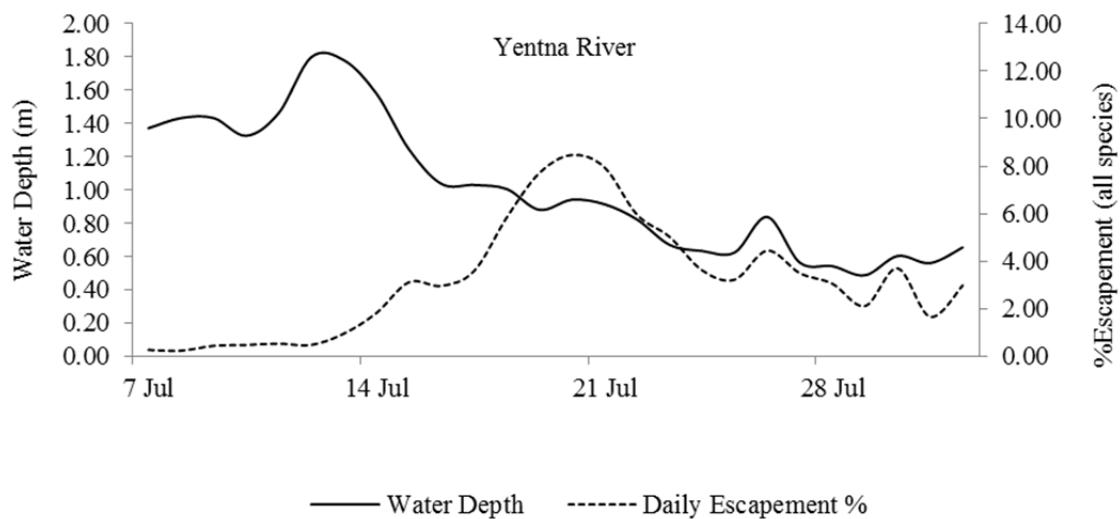


Figure 12.–Daily water level fluctuations (solid line) for the Yentna River, 2014.

Note: Daily escapement is included for comparison (dotted line).

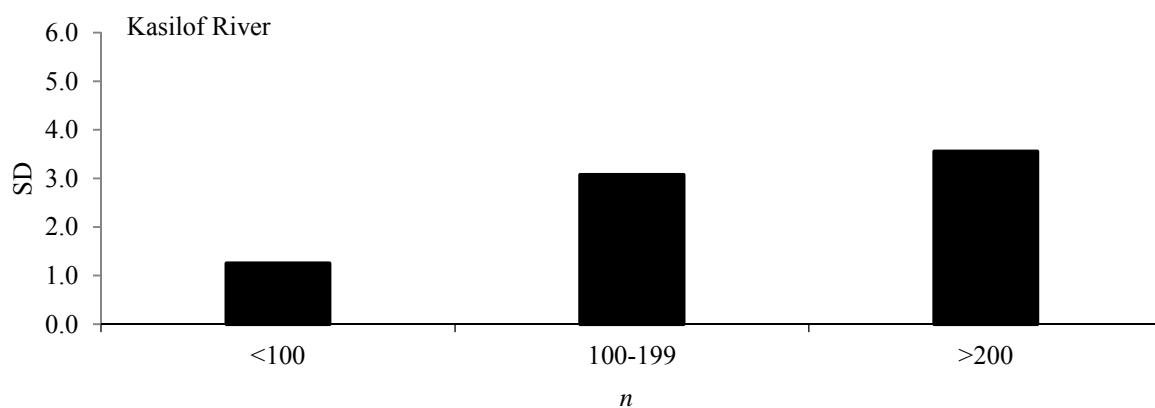
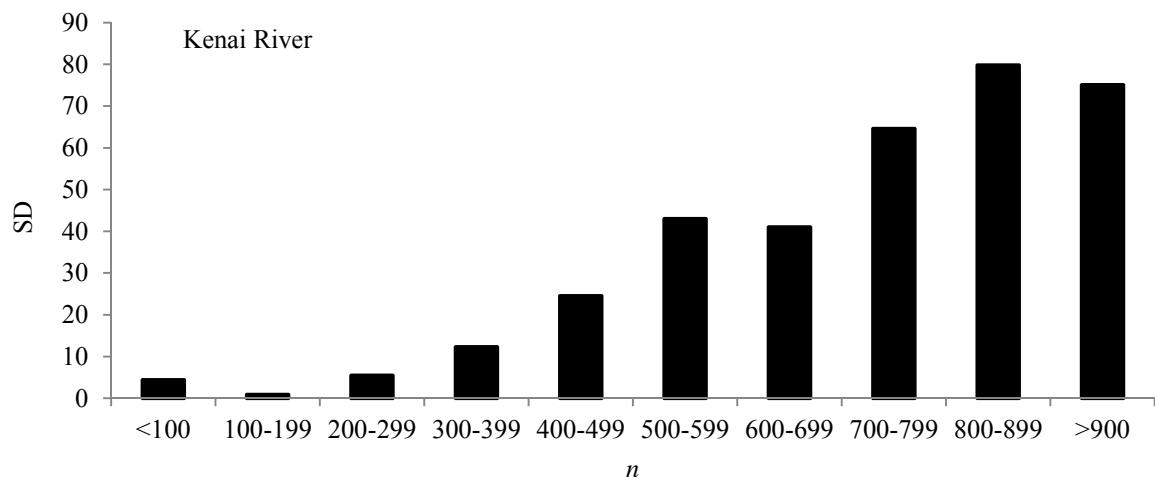


Figure 13.—Stratified average standard deviations between individual observer (subsample) counts and average crew counts for Kenai (top) and Kasilof (bottom) rivers sonar crews.

Note: Differences between observers increased with greater fish densities.

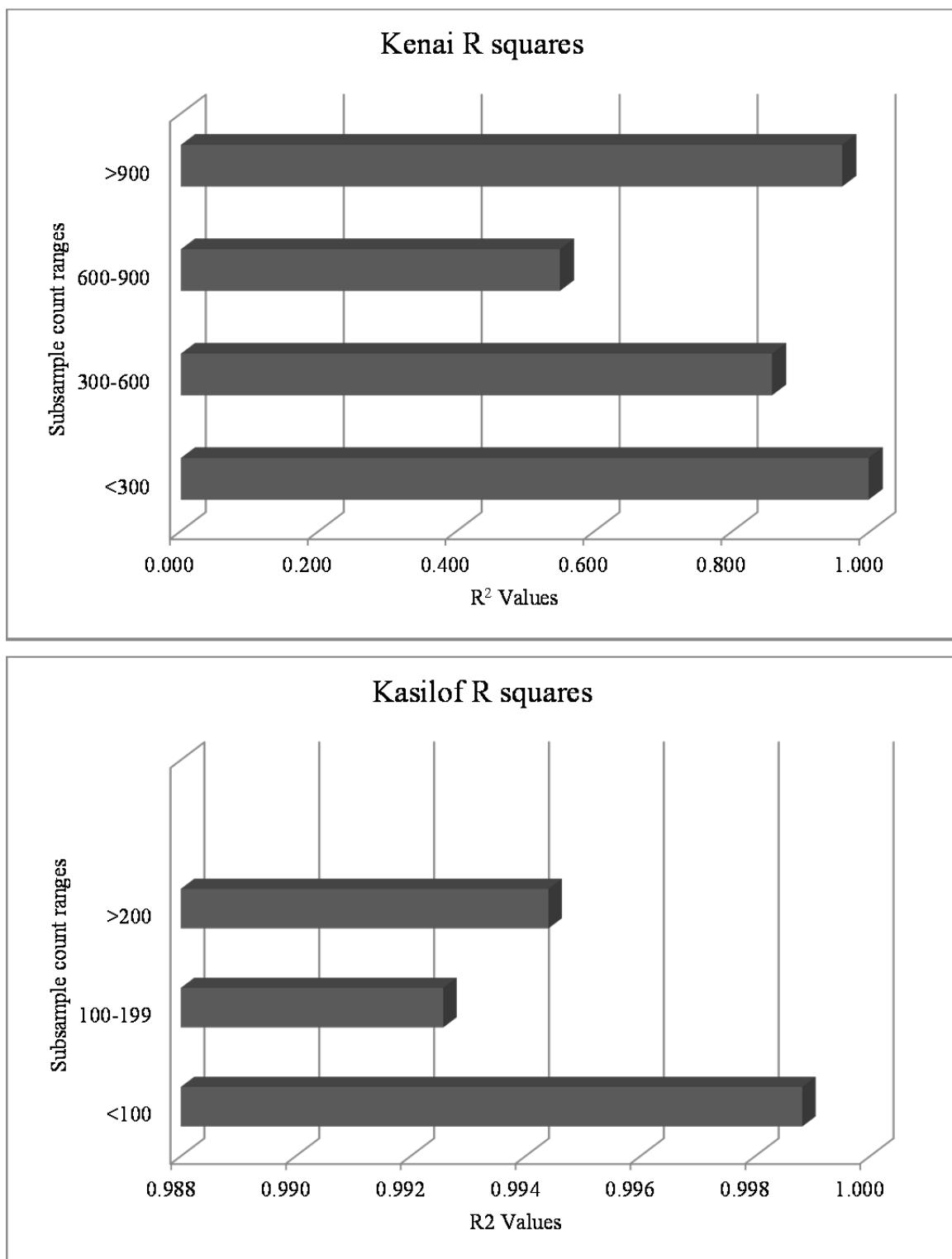


Figure 14.—Average R2s from observer subsample counts for Kenai (top) and Kasilof (bottom) rivers.

APPENDIX A: KENAI RIVER DATA

Appendix A1.—Salmon escapement estimates (DIDSON) along the north bank of the Kenai River, 2014.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	7,092	7,092	0	0	0	0	0	0
2 Jul	5,514	12,606	0	0	0	0	0	0
3 Jul	6,198	18,804	0	0	0	0	0	0
4 Jul	6,702	25,506	0	0	0	0	0	0
5 Jul	8,208	33,714	0	0	0	0	0	0
6 Jul	16,416	50,130	0	0	0	0	0	0
7 Jul	12,923	63,053	0	0	0	0	0	0
8 Jul	10,638	73,691	0	0	0	0	0	0
9 Jul	13,746	87,437	0	0	0	0	0	0
10 Jul	12,908	100,346	0	0	0	0	0	0
11 Jul	6,918	107,264	0	0	0	0	0	0
12 Jul	14,792	122,055	0	0	0	0	0	0
13 Jul	21,821	143,876	0	0	0	0	0	0
14 Jul	13,764	157,640	0	0	0	0	0	0
15 Jul	14,568	172,208	0	0	0	0	0	0
16 Jul	12,762	184,970	0	0	0	0	0	0
17 Jul	21,354	206,324	0	0	0	0	0	0
18 Jul	22,542	228,866	0	0	0	0	0	0
19 Jul	8,430	237,297	0	0	0	0	0	0
20 Jul	21,606	258,903	0	0	0	0	0	0
21 Jul	39,558	298,461	0	0	0	0	0	0
22 Jul	28,014	326,475	0	0	0	0	0	0
23 Jul	19,842	346,317	0	0	0	0	0	0
24 Jul	23,556	369,873	0	0	0	0	0	0
25 Jul	12,606	382,479	0	0	0	0	0	0
26 Jul	17,973	400,452	0	0	0	0	0	0
27 Jul	9,360	409,812	0	0	0	0	0	0
28 Jul	13,152	422,964	0	0	0	0	0	0
29 Jul	17,708	440,672	0	0	0	0	0	0
30 Jul	25,939	466,611	0	0	0	0	0	0
31 Jul	26,700	493,311	0	0	0	0	0	0
1 Aug	9,481	502,792	8,341	8,341	0	0	442	442
2 Aug	10,375	513,167	7,225	15,566	317	317	0	442
3 Aug	12,848	526,015	5,035	20,602	302	618	376	817
4 Aug	17,855	543,870	8,135	28,736	1,100	1,719	367	1,184
5 Aug	29,882	573,752	13,755	42,492	0	1,719	0	1,184
6 Aug	15,376	589,128	22,668	65,160	1,016	2,734	441	1,625
7 Aug	14,431	603,558	20,407	85,567	748	3,482	0	1,625
8 Aug	21,154	624,712	13,705	99,272	382	3,864	48	1,673
9 Aug	20,793	645,505	57,428	156,700	132	3,997	104	1,777
10 Aug	16,325	661,830	23,060	179,760	347	4,343	193	1,970
11 Aug	10,010	671,840	11,227	190,987	1,175	5,519	431	2,401
12 Aug	5,436	677,276	11,377	202,364	986	6,504	254	2,655
13 Aug	1,438	678,713	11,420	213,784	1,581	8,086	15	2,670
14 Aug	1,694	680,407	12,389	226,173	635	8,721	433	3,102
Sockeye 95% CI	671,747–689,067							

Appendix A2.—Salmon escapement estimates (DIDSON) along the south bank of the Kenai river, 2014.

Date	Sockeye		Pink		Coho		Chinook	
	Daily	Cum	Daily	Cum	Daily	Cum	Daily	Cum
1 Jul	3,300	3,300	0	0	0	0	0	0
2 Jul	3,726	7,026	0	0	0	0	0	0
3 Jul	4,596	11,622	0	0	0	0	0	0
4 Jul	2,586	14,208	0	0	0	0	0	0
5 Jul	3,366	17,574	0	0	0	0	0	0
6 Jul	13,074	30,648	0	0	0	0	0	0
7 Jul	16,152	46,800	0	0	0	0	0	0
8 Jul	6,234	53,034	0	0	0	0	0	0
9 Jul	10,451	63,485	0	0	0	0	0	0
10 Jul	7,404	70,889	0	0	0	0	0	0
11 Jul	5,688	76,577	0	0	0	0	0	0
12 Jul	8,832	85,409	0	0	0	0	0	0
13 Jul	10,068	95,477	0	0	0	0	0	0
14 Jul	9,432	104,909	0	0	0	0	0	0
15 Jul	9,295	114,204	0	0	0	0	0	0
16 Jul	8,172	122,376	0	0	0	0	0	0
17 Jul	11,034	133,410	0	0	0	0	0	0
18 Jul	16,500	149,910	0	0	0	0	0	0
19 Jul	8,106	158,016	0	0	0	0	0	0
20 Jul	12,498	170,514	0	0	0	0	0	0
21 Jul	24,372	194,886	0	0	0	0	0	0
22 Jul	16,218	211,104	0	0	0	0	0	0
23 Jul	17,644	228,748	0	0	0	0	0	0
24 Jul	14,399	243,147	0	0	0	0	0	0
25 Jul	17,238	260,385	0	0	0	0	0	0
26 Jul	14,040	274,425	0	0	0	0	0	0
27 Jul	12,713	287,138	0	0	0	0	0	0
28 Jul	18,426	305,564	0	0	0	0	0	0
29 Jul	20,605	326,169	0	0	0	0	0	0
30 Jul	32,064	358,233	0	0	0	0	0	0
31 Jul	40,080	398,313	0	0	0	0	0	0
1 Aug	25,469	423,782	3,759	3,759	0	0	466	466
2 Aug	23,131	446,913	3,173	6,932	441	441	0	466
3 Aug	37,324	484,237	3,210	10,142	632	1,073	656	1,121
4 Aug	37,042	521,279	6,978	17,120	2,584	3,657	1,335	2,457
5 Aug	81,926	603,205	31,718	48,838	173	3,830	520	2,976
6 Aug	48,220	651,425	68,635	117,473	1,797	5,627	1,907	4,883
7 Aug	43,668	695,093	53,035	170,508	1,861	7,488	196	5,079
8 Aug	33,915	729,008	18,094	188,602	608	8,095	283	5,363
9 Aug	32,550	761,558	87,493	276,095	179	8,274	394	5,756
10 Aug	41,756	803,315	58,951	335,046	810	9,085	574	6,330
11 Aug	20,419	823,734	22,997	358,043	2,337	11,422	869	7,200
12 Aug	8,798	832,533	18,552	376,595	1,600	13,022	703	7,903
13 Aug	3,046	835,579	24,432	401,027	3,351	16,373	122	8,024
14 Aug	4,354	839,933	32,162	433,188	1,633	18,005	1,089	9,113
Sockeye 95% CI		821,210–858,656						

Appendix A3.—Kenai River north bank DIDSON estimates (all species) by day and hour, 2014.

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Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	426	258	234	156	234	474	432	552	444	324	480	408
2 Jul	54	150	144	210	330	186	402	216	108	150	120	120
3 Jul	150	174	120	222	348	612	462	582	282	348	204	174
4 Jul	114	114	114	318	528	906	1,254	606	318	198	180	108
5 Jul	102	96	96	78	258	294	438	642	288	168	306	468
6 Jul	378	174	204	402	582	906	1,038	1,200	960	786	570	834
7 Jul	570	324	306	432	798	654	930	900	378	240	366	1,428
8 Jul	120	324	342	276	558	504	318	1,182	1,050	684	372	744
9 Jul	432	210	138	144	282	318	252	318	312	1,050	1,002	954
10 Jul	978	714	420	660	1,278	1,878	1,584	1,044	432	552	1,284	618
11 Jul	186	216	198	162	138	162	180	192	240	240	354	252
12 Jul	156	258	366	222	300	396	210	294	558	312	384	702
13 Jul	947	360	492	318	312	270	282	318	390	252	312	996
14 Jul	1,338	750	402	372	354	330	354	312	192	144	192	360
15 Jul	918	342	510	270	522	240	246	210	174	330	528	276
16 Jul	522	432	774	990	750	492	348	300	480	180	276	528
17 Jul	108	138	174	252	432	312	354	138	396	198	144	324
18 Jul	1,092	438	570	912	1,764	1,716	558	492	1,032	648	654	810
19 Jul	552	96	198	174	210	144	120	174	222	138	132	192
20 Jul	1,080	462	294	1,056	312	294	294	204	162	102	192	180
21 Jul	2,850	1,578	678	348	468	456	336	612	354	450	504	384
22 Jul	3,648	1,488	1,056	1,236	906	1,080	318	774	402	576	312	288
23 Jul	3,438	750	480	330	552	1,344	462	588	618	258	126	270
24 Jul	666	1,716	1,062	1,092	504	324	1,038	498	414	354	468	834
25 Jul	240	240	336	366	264	384	348	432	522	306	288	198
26 Jul	774	480	432	222	420	372	714	312	276	858	396	474
27 Jul	588	540	546	432	396	384	294	270	384	372	330	336
28 Jul	450	834	780	762	534	762	858	624	282	294	438	444
29 Jul	210	828	408	594	564	618	582	630	306	444	216	385
30 Jul	1,249	1,464	1,128	1,008	1,188	1,140	1,626	630	972	696	582	282
31 Jul	1,872	1,764	906	1,050	1,374	852	618	1,428	1,470	420	612	1,014

-continued-

Appendix A3.–Page 2 of 4.

Date	Estimates by hour											Daily total	
	13	14	15	16	17	18	19	20	21	22	23	24	
1 Jul	252	96	168	396	480	156	144	114	234	354	174	102	7,092
2 Jul	54	150	138	210	432	606	270	204	270	522	156	312	5,514
3 Jul	144	270	78	114	228	444	312	144	288	216	174	108	6,198
4 Jul	66	36	84	66	90	114	162	330	276	324	228	168	6,702
5 Jul	414	156	180	126	252	222	252	1,062	672	516	588	534	8,208
6 Jul	534	1,608	714	264	618	432	444	972	912	1,194	462	228	16,416
7 Jul	678	443	624	192	390	528	318	282	384	438	696	624	12,923
8 Jul	246	306	504	534	360	246	162	240	264	300	456	546	10,638
9 Jul	474	696	396	702	606	786	522	348	420	720	924	1,740	13,746
10 Jul	162	198	204	198	72	138	126	78	89	82	42	78	12,908
11 Jul	462	372	348	342	264	264	276	450	402	564	402	252	6,918
12 Jul	348	402	234	222	462	720	1,272	900	1,794	1,398	1,374	1,508	14,792
13 Jul	984	948	882	474	534	768	1,596	2,802	2,514	1,830	1,974	1,266	21,821
14 Jul	276	924	1,260	444	294	342	786	540	786	888	972	1,152	13,764
15 Jul	288	648	1,950	942	750	768	468	396	1,320	624	1,014	834	14,568
16 Jul	210	402	240	474	786	1,440	762	612	402	486	366	510	12,762
17 Jul	258	348	498	852	1,386	2,844	2,640	1,974	1,524	1,134	1,902	3,024	21,354
18 Jul	1,002	1,428	852	828	1,200	582	1,188	1,248	1,290	996	654	588	22,542
19 Jul	174	168	180	222	234	684	612	654	726	558	1,152	714	8,430
20 Jul	258	516	666	408	1,122	1,578	966	1,818	2,580	2,340	1,956	2,766	21,606
21 Jul	936	894	924	2,718	2,778	2,340	2,238	3,318	4,782	4,938	2,670	2,004	39,558
22 Jul	360	750	954	1,632	1,146	1,044	1,068	1,050	1,236	1,308	2,544	2,838	28,014
23 Jul	360	330	660	738	948	1,194	864	696	1,302	1,266	1,224	1,044	19,842
24 Jul	1,038	1,056	1,728	2,208	1,578	1,428	1,134	1,194	1,182	1,116	588	336	23,556
25 Jul	468	546	540	1,152	918	438	462	666	666	918	858	1,050	12,606
26 Jul	567	264	456	954	1,512	1,596	1,008	792	996	1,812	1,086	1,200	17,973
27 Jul	276	216	240	144	480	324	348	204	336	774	708	438	9,360
28 Jul	174	426	666	642	648	798	294	330	510	630	450	522	13,152
29 Jul	510	324	774	630	948	816	900	690	738	1,410	1,723	2,460	17,708
30 Jul	426	486	516	774	642	750	876	1,062	1,164	1,608	3,414	2,256	25,939
31 Jul	450	360	396	732	720	354	732	1,902	1,152	3,156	1,926	1,440	26,700

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Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	846	618	264	738	984	642	792	408	588	864	480	672
2 Aug	1,728	954	780	1,230	768	972	636	480	606	690	348	174
3 Aug	534	2,052	1,044	1,086	978	576	636	312	402	600	414	624
4 Aug	978	1,164	894	924	540	624	1,050	882	1,086	270	390	738
5 Aug	1,194	156	888	546	792	1,032	648	1,212	738	588	606	306
6 Aug	1,530	1,626	720	1,482	912	942	1,171	1,302	1,692	1,866	840	2,238
7 Aug	1,740	930	588	450	312	390	822	1,158	2,364	2,304	1,926	690
8 Aug	1,278	960	456	354	420	270	1,154	1,080	1,008	1,086	762	420
9 Aug	918	354	600	408	511	330	474	672	678	1,032	1,038	1,428
10 Aug	1,596	954	564	246	348	390	1,134	1,584	1,320	1,500	966	930
11 Aug	366	216	306	138	210	294	348	348	456	588	618	606
12 Aug	444	335	306	210	102	240	372	395	546	480	684	948
13 Aug	462	306	240	108	84	150	246	258	444	510	192	667
14 Aug	504	474	144	114	54	30	204	216	288	630	942	1,290
Total	40,326	28,811	21,702	23,100	24,475	25,686	26,937	26,981	26,634	25,080	22,530	27,116
%	4.4	3.1	2.4	2.5	2.7	2.8	2.9	2.9	2.9	2.7	2.5	3.0
Cum	4.4	7.5	9.9	12.4	15.1	17.9	20.8	23.7	26.6	29.4	31.8	34.8

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Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
1 Aug	708	702	276	732	696	990	972	1,302	996	582	1,512	900	18,264
2 Aug	252	354	252	240	1,092	354	558	414	666	1,242	1,086	2,040	17,916
3 Aug	606	558	414	444	426	600	828	1,080	1,362	1,443	768	774	18,561
4 Aug	1,026	258	1,632	1,674	960	1,296	1,230	1,542	1,002	2,538	3,408	1,351	27,457
5 Aug	420	1,140	906	930	564	473	450	3,432	7,368	10,074	7,026	2,148	43,637
6 Aug	906	654	3,276	912	2,100	1,152	1,728	2,621	1,308	2,801	3,215	2,508	39,501
7 Aug	1,122	1,446	1,380	1,074	1,104	1,050	918	1,494	2,388	1,776	3,798	4,362	35,586
8 Aug	912	684	1,284	1,134	780	4,974	1,638	3,426	3,420	2,376	3,498	1,962	35,336
9 Aug	1,866	2,448	2,616	2,160	3,276	6,174	8,862	17,664	10,770	8,394	4,680	1,104	78,457
10 Aug	1,980	3,468	2,406	3,750	3,012	3,108	1,428	2,580	2,052	2,166	1,698	744	39,924
11 Aug	471	888	1,332	1,560	1,290	1,212	2,544	2,532	2,442	1,590	1,758	732	22,844
12 Aug	1,098	1,218	1,278	1,212	1,512	1,008	1,176	1,170	978	870	756	714	18,052
13 Aug	588	534	798	1,212	840	864	798	1,242	1,080	1,140	912	779	14,454
14 Aug	1,278	1,314	1,716	894	834	576	768	438	510	726	918	288	15,150
Total	26,082	31,433	37,620	38,262	41,364	48,575	47,100	68,009	67,553	72,138	67,890	53,048	918,450
%	2.8	3.4	4.1	4.2	4.5	5.3	5.1	7.4	7.4	7.9	7.4	5.8	1.000
Cum	37.6	41.0	45.1	49.3	53.8	59.1	64.2	71.6	79.0	86.8	94.2	100.0	
95% Confidence interval													918,263–918,638

Appendix A4.—Kenai River south bank DIDSON estimates (all species) by day and hour, 2014.

Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Jul	84	180	408	306	108	162	114	36	42	120	108	132
2 Jul	72	84	204	162	96	108	66	42	54	90	150	168
3 Jul	84	126	168	198	342	114	36	48	36	30	138	360
4 Jul	72	162	150	174	90	78	36	54	90	168	378	330
5 Jul	42	102	126	54	78	90	144	30	54	120	162	216
6 Jul	180	300	408	294	306	132	306	96	102	372	756	612
7 Jul	558	486	246	348	264	120	330	1,020	1,230	1,104	1,482	1,344
8 Jul	504	228	228	276	180	54	84	90	120	342	792	294
9 Jul	480	366	150	264	168	24	96	66	306	690	1,043	1,308
10 Jul	618	366	312	600	306	390	330	174	270	714	462	528
11 Jul	168	96	48	60	60	90	90	144	228	234	396	510
12 Jul	222	114	144	72	66	30	132	174	234	354	198	462
13 Jul	900	750	312	144	126	90	132	156	204	264	462	702
14 Jul	648	918	708	252	198	132	114	138	156	270	330	288
15 Jul	468	756	756	360	132	66	132	126	186	318	234	366
16 Jul	462	462	606	282	138	138	282	384	558	294	318	240
17 Jul	348	222	366	234	144	198	234	270	210	114	210	402
18 Jul	1,050	858	1,014	792	462	948	1,740	798	1,086	318	750	726
19 Jul	366	282	246	222	120	90	156	168	96	84	174	258
20 Jul	486	306	516	366	132	156	156	300	480	294	138	504
21 Jul	1,980	672	1,296	714	564	342	696	714	1,086	636	258	1,074
22 Jul	1,434	438	1,116	420	258	336	954	714	774	528	216	198
23 Jul	2,034	1,836	1,458	840	318	612	348	432	792	486	322	288
24 Jul	1,199	702	492	390	258	402	330	660	786	288	300	420
25 Jul	402	246	258	102	108	234	132	144	192	210	234	276
26 Jul	678	456	150	222	132	222	162	432	504	486	552	492
27 Jul	504	276	216	108	89	132	258	510	696	576	306	456
28 Jul	900	480	276	388	426	324	300	474	690	528	552	354
29 Jul	768	366	174	259	168	294	228	306	666	618	456	648
30 Jul	1,092	894	384	528	456	588	642	1,128	1,101	795	678	768
31 Jul	1,722	1,074	498	456	630	1,296	1,170	1,266	816	1,782	876	1,386

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Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
1 Jul	240	252	120	258	258	132	54	30	42	12	54	48	3,300
2 Jul	192	186	216	150	102	282	312	342	216	138	108	186	3,726
3 Jul	276	150	144	246	750	444	318	240	114	78	102	54	4,596
4 Jul	126	72	72	54	48	96	90	96	42	42	42	24	2,586
5 Jul	264	210	84	180	144	198	222	312	216	54	108	156	3,366
6 Jul	1,182	294	390	852	1,182	924	558	258	762	1,158	1,050	600	13,074
7 Jul	672	1,044	624	1,080	672	408	378	354	396	720	798	474	16,152
8 Jul	420	354	282	144	192	270	168	108	156	150	360	438	6,234
9 Jul	894	318	534	312	318	222	204	324	402	516	690	756	10,451
10 Jul	348	174	126	180	90	390	312	198	114	138	156	108	7,404
11 Jul	420	192	180	240	312	474	516	402	336	222	114	156	5,688
12 Jul	258	372	270	228	252	612	1,080	612	426	906	696	918	8,832
13 Jul	390	366	324	444	228	318	684	906	624	348	402	792	10,068
14 Jul	336	606	462	630	216	480	246	354	438	360	498	654	9,432
15 Jul	366	270	612	582	462	426	354	378	361	372	270	942	9,295
16 Jul	210	198	216	546	576	330	396	606	150	282	264	234	8,172
17 Jul	180	306	462	294	1,038	1,224	1,050	780	738	726	456	828	11,034
18 Jul	570	312	354	336	558	372	510	840	708	414	540	444	16,500
19 Jul	168	240	300	330	324	288	432	444	582	816	912	1,008	8,106
20 Jul	282	546	324	648	576	924	726	750	900	864	1,098	1,026	12,498
21 Jul	912	732	1,134	1,260	1,464	822	1,080	1,440	1,152	1,572	1,554	1,218	24,372
22 Jul	276	936	660	636	528	504	504	552	948	1,050	1,260	978	16,218
23 Jul	384	408	630	768	534	876	450	426	1,008	894	816	684	17,644
24 Jul	894	810	1,128	576	624	606	822	738	582	234	588	570	14,399
25 Jul	396	690	738	1,446	1,314	1,428	1,062	1,296	2,472	1,464	1,284	1,110	17,238
26 Jul	510	504	504	1,104	528	798	498	1,290	1,146	642	1,026	1,002	14,040
27 Jul	276	486	516	978	666	696	786	462	750	1,248	834	888	12,713
28 Jul	925	600	456	2,028	1,578	1,182	1,566	738	924	882	1,068	786	18,426
29 Jul	438	756	942	636	1,098	1,794	2,106	1,830	1,440	1,434	1,524	1,656	20,605
30 Jul	984	1,596	1,974	1,356	1,446	2,742	2,178	2,304	1,428	2,112	2,508	2,382	32,064
31 Jul	2,202	1,986	1,890	1,182	966	2,676	2,376	3,186	2,778	3,120	1,770	2,976	40,080

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Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	2,736	2,196	1,116	624	426	360	1,398	972	1,182	882	792	726
2 Aug	1,158	864	480	330	408	336	732	822	1,007	696	732	384
3 Aug	2,490	1,278	1,146	840	1,122	637	1,140	1,374	2,040	1,284	816	882
4 Aug	1,644	1,392	636	570	1,020	918	1,152	1,152	1,704	2,514	1,344	1,818
5 Aug	2,364	1,890	1,014	552	480	1,164	2,118	1,758	3,192	3,282	1,902	564
6 Aug	9,732	3,846	804	1,740	1,932	1,968	3,480	5,250	7,464	1,914	3,954	2,892
7 Aug	5,400	2,190	774	198	270	402	1,686	4,074	3,606	4,656	4,812	2,682
8 Aug	3,264	708	378	270	210	246	1,561	2,304	2,844	3,072	1,596	822
9 Aug	504	246	372	168	225	144	762	960	1,272	1,668	1,512	3,012
10 Aug	1,974	726	174	410	204	222	1,626	4,446	2,298	7,380	3,336	2,772
11 Aug	384	234	228	72	108	132	720	1,296	1,116	1,188	1,335	1,494
12 Aug	267	150	132	66	90	132	426	666	984	1,218	1,302	1,362
13 Aug	318	144	66	60	36	102	552	714	1,158	558	1,200	1,296
14 Aug	744	390	198	171	55	96	462	912	1,068	1,998	1,992	2,574
Total	53,504	30,858	20,952	15,959	13,509	14,851	27,745	37,794	44,780	45,537	40,055	39,390
%	4.1	2.4	1.6	1.2	1.0	1.1	2.1	2.9	3.4	3.5	3.1	3.0
Cum	4.1	6.5	8.1	9.3	10.4	11.5	13.6	16.5	20.0	23.5	26.6	29.6

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Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
1 Aug	774	1,008	1,002	888	1,548	1,398	1,218	1,476	1,476	1,536	2,166	1,794	29,694
2 Aug	606	912	894	978	1,092	798	1,396	1,956	2,142	2,754	2,310	2,958	26,745
3 Aug	1,584	2,874	1,956	1,434	642	1,811	1,910	2,634	2,262	3,360	3,468	2,838	41,821
4 Aug	3,852	4,674	810	2,916	1,272	864	2,334	4,158	2,970	2,298	2,322	3,606	47,940
5 Aug	4,392	4,062	4,278	6,366	3,882	5,412	8,604	8,136	10,260	11,064	14,628	12,972	114,336
6 Aug	8,339	4,434	3,342	4,386	3,966	5,874	4,398	7,746	9,024	8,718	8,972	6,384	120,559
7 Aug	2,034	2,580	4,566	3,414	5,880	5,628	5,580	7,080	10,482	11,280	6,684	2,802	98,760
8 Aug	930	1,182	1,692	2,310	2,424	1,354	5,064	2,836	6,984	4,698	4,140	2,088	52,976
9 Aug	4,416	3,984	3,600	3,936	5,148	10,632	13,440	6,576	15,408	15,066	15,624	11,940	120,615
10 Aug	4,926	6,618	5,592	7,386	8,964	6,342	6,438	9,696	10,440	5,484	3,570	1,068	102,092
11 Aug	1,650	2,166	2,370	2,928	4,146	3,150	3,492	6,996	5,292	3,132	2,208	786	46,623
12 Aug	1,002	2,284	2,586	1,932	2,016	1,956	2,340	2,490	2,406	1,851	1,452	543	29,653
13 Aug	732	1,854	2,058	2,760	2,076	2,442	2,976	2,640	1,950	1,959	2,286	1,014	30,951
14 Aug	2,910	2,154	2,772	2,586	2,250	2,388	2,628	2,478	2,982	1,962	2,694	774	39,238
Total	54,138	56,752	54,186	63,924	64,350	72,986	83,855	89,494	106,429	98,130	95,474	75,664	1,300,316
%	4.2	4.4	4.2	4.9	4.9	5.6	6.4	6.9	8.2	7.5	7.3	5.8	
Cum	33.8	38.1	42.3	47.2	52.2	57.8	64.2	71.1	79.3	86.8	94.2	100.0	
95% Confidence interval													1,300,058–1,300,574

APPENDIX B: KASILOF RIVER DATA

Appendix B1.—Estimated sockeye salmon escapement (DIDSON) along the north bank of the Kaslof River, 2014.

Date	Daily	Cum	Date	Daily	Cum
15 Jun	1,713	1,713	16 Jul	10,254	149,032
16 Jun	1,391	3,104	17 Jul	9,108	158,140
17 Jun	2,347	5,451	18 Jul	18,708	176,848
18 Jun	4,902	10,353	19 Jul	8,238	185,086
19 Jun	7,716	18,069	20 Jul	7,458	192,544
20 Jun	7,992	26,061	21 Jul	12,846	205,390
21 Jun	3,012	29,073	22 Jul	6,240	211,630
22 Jun	3,078	32,151	23 Jul	6,738	218,368
23 Jun	2,856	35,007	24 Jul	7,429	225,797
24 Jun	2,099	37,106	25 Jul	4,542	230,339
25 Jun	5,016	42,122	26 Jul	4,054	234,393
26 Jun	8,398	50,520	27 Jul	2,898	237,291
27 Jun	1,944	52,464	28 Jul	3,108	240,399
28 Jun	2,208	54,672	29 Jul	5,202	245,601
29 Jun	1,338	56,010	30 Jul	4,104	249,705
30 Jun	3,366	59,376	31 Jul	8,142	257,847
1 Jul	1,740	61,116	1 Aug	5,685	263,533
2 Jul	3,492	64,608	2 Aug	3,037	266,570
3 Jul	3,018	67,626	3 Aug	1,064	267,634
4 Jul	2,250	69,876	4 Aug	2,090	269,723
5 Jul	4,764	74,640	5 Aug	1,387	271,110
6 Jul	6,318	80,958	6 Aug	2,126	273,236
7 Jul	7,554	88,512	7 Aug	1,570	274,806
8 Jul	4,332	92,844			
9 Jul	6,816	99,660			
10 Jul	3,054	102,714			
11 Jul	7,110	109,824			
12 Jul	5,712	115,536			
13 Jul	3,064	118,600			
14 Jul	6,738	125,338			
15 Jul	13,440	138,778			
Sockeye 95% CI			273,466–276,146		

Appendix B2.—Estimated sockeye salmon escapement (DIDSON) along the south bank of the Kaslof River, 2014.

Date	Daily	Cum	Date	Daily	Cum
15 Jun	5,874	5,874	16 Jul	2,058	130,521
16 Jun	4,961	10,835	17 Jul	1,458	131,979
17 Jun	4,854	15,689	18 Jul	3,012	134,991
18 Jun	8,394	24,083	19 Jul	2,172	137,163
19 Jun	10,134	34,217	20 Jul	2,304	139,467
20 Jun	8,214	42,431	21 Jul	4,080	143,547
21 Jun	6,708	49,139	22 Jul	2,070	145,617
22 Jun	4,746	53,885	23 Jul	2,508	148,125
23 Jun	4,698	58,583	24 Jul	2,220	150,345
24 Jun	2,136	60,719	25 Jul	1,170	151,515
25 Jun	5,604	66,323	26 Jul	1,092	152,607
26 Jun	11,396	77,719	27 Jul	1,314	153,921
27 Jun	2,106	79,825	28 Jul	1,303	155,224
28 Jun	1,986	81,811	29 Jul	1,260	156,484
29 Jun	1,314	83,125	30 Jul	1,242	157,726
30 Jun	3,890	87,015	31 Jul	1,968	159,694
1 Jul	1,344	88,359	1 Aug	1,352	161,046
2 Jul	3,288	91,647	2 Aug	985	162,031
3 Jul	3,588	95,235	3 Aug	358	162,389
4 Jul	930	96,165	4 Aug	1,045	163,434
5 Jul	2,676	98,841	5 Aug	567	164,002
6 Jul	3,822	102,663	6 Aug	864	164,866
7 Jul	3,780	106,443	7 Aug	520	165,386
8 Jul	2,478	108,921			
9 Jul	4,236	113,157			
10 Jul	1,506	114,663			
11 Jul	3,276	117,939			
12 Jul	3,828	121,767			
13 Jul	1,254	123,021			
14 Jul	1,572	124,593			
15 Jul	3,870	128,463			
Sockeye 95% CI			164,906–165,866		

Appendix B3.—Kasilof river north bank DIDSON subsample estimates by day and hour, 2014.

Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	42	54	72	60	66	144	198	66	54	84	84	78
16 Jun	24	24	18	18	48	60	162	186	108	162	120	54
17 Jun	6	28	41	47	66	113	136	129	42	30	54	186
18 Jun	78	72	78	54	60	78	42	24	372	420	120	162
19 Jun	162	270	108	48	72	78	42	60	60	90	288	210
20 Jun	114	312	426	330	186	138	144	222	162	216	450	1,074
21 Jun	270	54	132	276	174	84	54	54	78	84	90	90
22 Jun	582	240	42	54	246	78	60	78	24	96	66	132
23 Jun	156	192	246	48	54	252	246	84	60	84	84	78
24 Jun	12	50	61	67	122	76	63	53	30	36	24	78
25 Jun	246	252	270	768	282	72	72	126	96	66	78	90
26 Jun	90	96	132	126	294	90	36	318	156	216	162	132
27 Jun	42	30	24	30	30	66	42	36	66	90	42	66
28 Jun	30	12	30	54	90	162	96	72	132	144	54	66
29 Jun	78	12	0	6	24	30	42	36	24	12	24	36
30 Jun	66	60	30	12	66	78	60	144	246	300	306	138
1 Jul	96	42	42	24	30	12	18	120	84	24	18	24
2 Jul	66	36	90	42	36	54	54	78	96	126	150	84
3 Jul	246	150	90	72	30	66	90	114	30	420	270	90
4 Jul	18	12	12	42	42	24	12	12	84	96	168	150
5 Jul	66	108	216	132	102	84	54	96	54	114	186	324
6 Jul	150	96	108	72	114	48	108	42	36	36	222	192
7 Jul	954	366	264	420	144	102	156	60	162	270	342	252
8 Jul	168	390	240	354	126	96	48	48	120	144	150	84
9 Jul	372	312	300	246	330	462	108	192	102	108	252	114
10 Jul	84	24	72	72	84	12	132	78	42	72	12	60
11 Jul	48	204	180	660	798	138	270	120	18	60	30	24
12 Jul	132	168	180	150	1,092	396	60	510	360	288	282	132
13 Jul	42	84	78	60	48	168	108	36	222	240	294	174
14 Jul	114	96	60	42	108	84	1,068	192	192	264	330	132
15 Jul	342	150	156	84	66	294	234	1,032	366	432	2,130	816
16 Jul	234	198	144	138	120	180	96	90	1,068	312	666	1,098
17 Jul	558	264	252	132	84	42	36	6	48	984	414	486
18 Jul	78	420	204	174	126	222	126	36	210	228	1,860	924
19 Jul	648	834	336	192	84	96	132	168	54	96	216	282
20 Jul	474	354	150	78	60	330	432	156	132	174	192	270
21 Jul	348	1,074	558	390	186	114	228	156	402	264	600	750
22 Jul	96	66	150	132	204	144	168	84	264	150	126	126
23 Jul	96	60	138	426	324	288	312	186	252	150	60	186
24 Jul	54	102	24	42	84	354	354	522	450	210	114	420
25 Jul	12	36	42	12	78	354	276	348	258	300	126	150
26 Jul	78	36	42	24	54	174	618	378	330	168	270	204
27 Jul	42	42	12	36	30	60	162	252	162	72	186	90
28 Jul	72	48	42	48	36	66	30	138	174	180	210	264
29 Jul	12	30	30	72	36	60	198	528	708	186	450	396
30 Jul	198	54	36	54	42	156	90	168	450	228	288	480
31 Jul	66	30	30	138	168	270	282	198	156	504	174	738

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Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
15 Jun	54	96	6	60	30	30	18	63	36	180	108	30	1,713
16 Jun	36	48	84	30	58	59	25	19	12	12	18	6	1,391
17 Jun	84	24	98	54	54	105	180	84	126	330	150	180	2,347
18 Jun	714	342	342	138	102	120	102	240	234	648	102	258	4,902
19 Jun	204	108	960	330	216	114	198	162	192	300	2,352	1,092	7,716
20 Jun	522	138	102	630	426	222	126	144	132	258	492	1,026	7,992
21 Jun	126	294	120	114	240	222	72	18	30	42	138	156	3,012
22 Jun	78	102	240	102	60	222	210	84	66	36	48	132	3,078
23 Jun	186	48	72	384	156	60	90	96	54	60	18	48	2,856
24 Jun	36	54	96	108	192	162	90	186	132	114	138	120	2,099
25 Jun	66	60	90	198	744	432	90	282	330	126	108	72	5,016
26 Jun	108	108	132	432	294	2,304	576	814	1,158	414	138	72	8,398
27 Jun	48	60	42	54	96	120	426	156	120	90	66	102	1,944
28 Jun	36	12	48	30	12	114	102	300	102	150	270	90	2,208
29 Jun	48	24	24	36	24	48	12	42	90	180	354	132	1,338
30 Jun	84	96	120	48	120	228	270	288	324	108	96	78	3,366
1 Jul	36	12	36	24	24	60	54	48	102	144	246	420	1,740
2 Jul	138	240	168	78	42	138	90	378	216	522	318	252	3,492
3 Jul	78	186	114	168	108	138	114	126	144	84	66	24	3,018
4 Jul	276	132	162	102	72	66	138	216	72	48	186	108	2,250
5 Jul	204	360	156	276	300	252	102	246	180	246	348	558	4,764
6 Jul	504	408	684	570	546	648	300	216	186	30	90	912	6,318
7 Jul	432	1,068	1,122	474	324	114	180	126	78	66	54	24	7,554
8 Jul	120	90	150	522	216	312	210	138	150	108	168	180	4,332
9 Jul	108	114	228	1,068	744	210	438	576	210	102	96	24	6,816
10 Jul	54	126	198	84	510	276	72	504	162	156	108	60	3,054
11 Jul	6	36	60	246	174	858	108	678	972	840	342	240	7,110
12 Jul	156	30	48	54	144	132	360	24	90	330	438	156	5,712
13 Jul	84	18	72	60	24	66	186	148	36	360	216	240	3,064
14 Jul	228	132	90	42	84	66	138	684	156	780	1,158	498	6,738
15 Jul	606	618	654	462	336	372	516	486	810	276	1,356	846	13,440
16 Jul	954	366	438	324	270	414	414	408	312	810	354	846	10,254
17 Jul	708	690	588	138	240	192	306	354	450	1,020	882	234	9,108
18 Jul	720	1,656	1,746	1,278	1,404	960	966	546	606	768	1,830	1,620	18,708
19 Jul	1,122	1,014	408	714	432	318	240	126	162	102	108	354	8,238
20 Jul	174	726	396	888	498	474	258	330	96	294	240	282	7,458
21 Jul	738	756	702	1,578	1,146	990	900	402	288	54	114	108	12,846
22 Jul	264	210	156	534	1,110	792	630	306	144	102	216	66	6,240
23 Jul	150	330	222	402	660	588	540	444	306	306	186	126	6,738
24 Jul	247	234	210	294	420	1,596	840	342	228	174	78	36	7,429
25 Jul	18	90	138	96	234	186	840	234	180	276	132	126	4,542
26 Jul	126	102	30	42	54	136	168	276	270	108	264	102	4,054
27 Jul	48	18	30	108	222	66	72	276	240	300	234	138	2,898
28 Jul	210	114	132	108	174	108	120	36	216	126	366	90	3,108
29 Jul	270	168	114	198	138	60	120	204	534	384	144	162	5,202
30 Jul	258	168	108	36	48	192	210	144	192	246	126	132	4,104
31 Jul	912	1,014	708	372	288	408	156	264	228	240	438	360	8,142

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Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	234	210	102	60	18	78	642	420	444	240	396	492
2 Aug	126	126	30	42	36	42	84	97	84	180	156	60
3 Aug	54	54	60	30	12	66	114	78	120	114	120	42
4 Aug	132	210	96	72	36	12	48	96	114	108	96	42
5 Aug	48	132	66	66	36	48	60	54	84	132	168	60
6 Aug	54	78	54	54	114	60	60	138	132	234	228	390
7 Aug	66	30	36	60	36	30	30	186	156	96	198	144
Total	8,676	8,484	6,432	6,942	7,034	6,885	8,593	8,901	9,930	10,134	14,196	13,416
%	3.0	3.0	2.2	2.4	2.5	2.4	3.0	3.1	3.5	3.5	5.0	4.7
Cum	3.0	6.0	8.2	10.7	13.1	15.5	18.5	21.6	25.1	28.6	33.6	38.3

Date	Estimates by Hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
1 Aug	546	432	402	192	318	162	66	252	156	96	156	246	6,360
2 Aug	396	270	234	426	270	306	138	192	174	216	60	120	3,865
3 Aug	162	282	138	366	276	126	450	462	390	114	120	240	3,990
4 Aug	108	144	246	342	546	288	90	228	180	306	132	60	3,732
5 Aug	66	84	96	102	192	108	216	168	234	180	150	60	2,610
6 Aug	294	144	222	198	282	150	168	132	138	114	132	18	3,588
7 Aug	168	138	270	330	114	408	312	198	276	570	348	90	4,290
Total	14,119	14,334	14,252	16,044	15,808	17,298	13,813	13,896	12,702	14,046	16,596	13,752	286,282
%	4.9	5.0	5.0	5.6	5.5	6.0	4.8	4.9	4.4	4.9	5.8	4.8	
Cum	43.2	48.2	53.2	58.8	64.3	70.4	75.2	80.1	84.5	89.4	95.2	100	
95% Confidence interval													286,216–286,348

Appendix B4.—Kasilof River south bank DIDSON subsample estimates by day and hour, 2014.

Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
15 Jun	132	102	138	138	306	234	1350	354	360	390	360	210
16 Jun	78	42	66	84	120	114	144	954	282	276	510	192
17 Jun	240	150	54	78	84	24	114	180	942	186	366	300
18 Jun	312	246	198	168	138	90	96	186	816	1794	336	192
19 Jun	1176	642	240	330	216	324	168	216	264	318	1332	1188
20 Jun	420	354	378	324	306	138	240	168	546	234	810	558
21 Jun	288	84	198	696	858	486	366	48	192	222	276	156
22 Jun	528	252	96	36	570	318	120	48	72	108	96	162
23 Jun	318	738	480	126	204	678	300	180	126	120	72	144
24 Jun	24	30	120	78	24	72	102	96	66	66	36	66
25 Jun	168	234	366	942	630	264	108	348	174	72	48	138
26 Jun	114	132	294	534	1,890	1,176	330	2,082	1,020	528	602	156
27 Jun	72	54	24	72	156	348	150	48	162	90	72	78
28 Jun	30	18	24	84	96	48	366	114	66	198	114	78
29 Jun	60	54	6	30	24	24	90	12	30	24	54	72
30 Jun	60	48	30	108	78	102	666	552	168	72	374	240
1 Jul	102	90	42	42	42	18	24	18	156	48	60	54
2 Jul	102	60	66	54	24	42	66	84	540	558	204	138
3 Jul	150	84	84	108	138	180	138	294	276	582	444	258
4 Jul	6	30	0	18	6	6	18	0	18	48	96	126
5 Jul	12	108	168	126	96	54	30	150	60	72	168	318
6 Jul	336	60	12	66	60	66	90	42	12	126	84	150
7 Jul	768	522	354	252	264	252	162	234	252	108	72	96
8 Jul	192	186	234	252	144	54	48	84	120	60	18	72
9 Jul	180	168	576	360	174	276	234	168	90	78	180	150
10 Jul	24	60	48	66	78	42	144	132	72	90	30	30
11 Jul	78	180	198	276	588	84	294	252	108	84	66	18
12 Jul	48	108	162	174	198	282	186	798	822	330	270	36
13 Jul	96	30	30	24	36	66	96	60	126	180	108	18
14 Jul	60	72	72	18	24	90	126	54	24	90	162	126
15 Jul	36	126	108	90	60	72	198	570	396	198	282	372
16 Jul	120	102	108	138	96	156	60	42	150	216	30	96
17 Jul	198	198	150	72	66	30	12	36	36	126	78	12
18 Jul	666	330	156	90	132	48	42	30	42	18	102	276
19 Jul	114	300	144	102	78	54	42	96	138	66	78	60
20 Jul	156	54	60	162	66	72	54	102	48	66	54	24
21 Jul	114	222	312	186	186	90	156	132	84	126	78	240
22 Jul	72	108	138	150	72	354	96	102	72	102	66	60
23 Jul	12	66	36	168	378	174	312	114	30	72	54	66
24 Jul	72	36	54	24	60	162	168	90	150	54	108	42
25 Jul	24	6	6	6	6	162	168	126	90	120	36	42
26 Jul	6	42	30	48	36	132	120	54	48	114	120	48
27 Jul	24	36	54	18	66	42	66	72	72	54	42	72
28 Jul	30	66	54	42	0	18	24	126	138	108	42	72
29 Jul	30	54	66	24	6	84	138	24	114	96	120	24
30 Jul	108	72	54	54	36	30	36	108	96	108	78	54
31 Jul	24	66	30	42	42	108	60	204	96	108	114	108

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Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
15 Jun	144	78	72	54	72	48	30	174	186	288	510	144	5,874
16 Jun	102	84	102	162	102	127	226	202	248	306	114	324	4,961
17 Jun	174	66	96	84	96	18	66	168	180	378	312	498	4,854
18 Jun	294	216	162	108	162	180	60	132	282	1,038	558	630	8,394
19 Jun	492	228	354	510	180	132	264	168	246	408	516	222	10,134
20 Jun	618	558	120	558	300	156	48	132	36	78	258	876	8,214
21 Jun	282	636	576	54	126	198	102	96	120	90	156	402	6,708
22 Jun	96	90	444	456	198	264	162	96	42	84	180	228	4,746
23 Jun	78	60	90	228	252	90	120	132	48	72	12	30	4,698
24 Jun	102	108	114	84	174	132	84	108	246	36	90	78	2,136
25 Jun	90	84	144	138	114	150	42	540	516	132	96	66	5,604
26 Jun	192	102	84	144	282	444	522	138	384	114	54	78	11,396
27 Jun	60	78	36	60	60	48	48	30	96	174	54	36	2,106
28 Jun	54	24	30	36	60	42	84	138	78	66	78	60	1,986
29 Jun	36	60	12	36	24	54	24	84	174	132	108	90	1,314
30 Jun	228	114	48	72	168	84	114	60	312	30	42	120	3,890
1 Jul	30	12	30	78	72	18	36	90	66	42	60	114	1,344
2 Jul	384	216	162	132	84	108	96	12	36	6	36	78	3,288
3 Jul	120	198	60	42	42	102	36	54	48	36	84	30	3,588
4 Jul	36	60	24	24	12	42	24	24	36	30	90	156	930
5 Jul	132	108	78	48	42	18	42	24	48	204	420	150	2,676
6 Jul	516	462	222	150	96	102	96	120	162	174	300	318	3,822
7 Jul	72	36	36	24	30	24	90	12	30	42	24	24	3,780
8 Jul	42	66	48	114	126	72	78	102	84	78	138	66	2,478
9 Jul	72	84	168	90	336	186	42	378	66	102	48	30	4,236
10 Jul	36	24	30	132	66	66	36	54	18	66	66	96	1,506
11 Jul	6	0	30	24	66	270	72	138	150	126	60	108	3,276
12 Jul	12	6	18	6	24	0	30	12	48	162	72	24	3,828
13 Jul	18	12	12	12	6	12	0	42	6	48	90	126	1,254
14 Jul	96	24	6	24	24	18	18	12	66	48	162	156	1,572
15 Jul	132	186	48	36	72	186	162	90	114	42	126	168	3,870
16 Jul	132	90	66	42	12	24	66	12	12	72	72	144	2,058
17 Jul	90	66	42	42	42	6	12	12	36	12	60	24	1,458
18 Jul	24	36	102	66	36	30	18	96	30	90	282	270	3,012
19 Jul	18	84	144	102	84	48	78	96	114	90	30	12	2,172
20 Jul	72	66	180	258	264	168	60	144	12	12	120	30	2,304
21 Jul	144	186	186	300	726	270	150	24	24	60	48	36	4,080
22 Jul	24	42	18	108	90	60	102	84	18	24	66	42	2,070
23 Jul	132	66	30	96	102	144	114	78	126	60	60	18	2,508
24 Jul	48	18	42	84	84	330	150	78	132	108	78	48	2,220
25 Jul	84	42	18	42	18	0	36	66	24	0	30	18	1,170
26 Jul	48	78	6	6	6	12	0	6	30	12	66	24	1,092
27 Jul	138	42	36	12	36	12	66	54	120	60	66	54	1,314
28 Jul	60	48	42	24	6	24	19	66	60	48	90	96	1,303
29 Jul	48	24	30	12	18	12	0	30	42	60	30	174	1,260
30 Jul	102	42	24	18	18	0	0	48	36	54	18	48	1,242
31 Jul	84	54	192	48	84	90	138	54	36	78	66	42	1,968

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Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
1 Aug	54	90	72	36	12	60	150	156	132	60	72	192
2 Aug	36	96	72	24	0	48	18	30	12	30	42	36
3 Aug	0	42	30	12	12	42	18	42	114	72	48	18
4 Aug	108	102	66	48	18	18	6	18	60	108	84	48
5 Aug	18	48	48	30	18	24	30	24	42	42	30	18
6 Aug	42	60	78	48	90	156	72	66	24	48	72	48
7 Aug	54	48	18	18	18	36	54	126	36	18	18	36
Total	8,292	7,308	6,702	7,296	9,126	8,124	8,466	10,446	10,182	9,282	9,268	7,584
%	4.9	4.3	4.0	4.3	5.4	4.8	5.0	6.2	6.0	5.5	5.5	4.5
Cum	4.9	9.2	13.1	17.4	22.8	27.6	32.6	38.8	44.8	50.2	55.7	60.2

Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
1 Aug	12	48	48	12	78	25	36	12	18	48	30	60	1,512
2 Aug	42	102	30	24	6	12	84	18	198	204	60	30	1,254
3 Aug	54	42	36	60	60	138	66	174	102	60	36	66	1,344
4 Aug	66	84	144	138	150	132	72	42	60	228	48	18	1,866
5 Aug	-6	48	18	42	96	120	72	54	96	72	72	12	1,068
6 Aug	30	72	84	54	54	48	66	108	54	6	60	18	1,458
7 Aug	42	96	78	84	78	54	114	66	84	120	78	48	1,422
Total	6,234	5,556	5,052	5,394	5,616	5,149	4,373	4,984	5,636	6,210	6,480	6,858	169,618
%	3.7	3.3	3.0	3.2	3.3	3.0	2.6	2.6	3.3	3.7	3.8	4.0	
Cum	63.9	67.1	70.1	73.3	76.6	79.6	82.2	85.2	88.5	92.1	96.0	100.0	
95% Confidence interval													169,574–169,661

APPENDIX C: YENTNA RIVER DATA

Appendix C1.—Estimated salmon escapement ranges along the north bank of the Yentna River, 2014.

Date	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	203	264	203	264	7	53	7	53
8 Jul	203	241	405	505	5	43	12	96
9 Jul	95	167	500	672	17	91	29	188
10 Jul	37	96	537	767	33	141	62	329
11 Jul	57	168	595	935	62	201	124	530
12 Jul	133	236	728	1,172	9	72	133	602
13 Jul	115	226	843	1,398	32	166	165	768
14 Jul	127	338	970	1,736	112	421	277	1,189
15 Jul	121	505	1,091	2,241	464	1,052	740	2,242
16 Jul	66	337	1,157	2,578	863	1,605	1,604	3,846
17 Jul	93	548	1,250	3,126	1,474	2,378	3,078	6,224
18 Jul	94	605	1,344	3,731	2,329	3,430	5,407	9,654
19 Jul	284	1,660	1,628	5,392	3,730	6,048	9,138	15,702
20 Jul	284	1,446	1,911	6,837	2,820	5,256	11,957	20,957
21 Jul	327	1,428	2,238	8,265	2,576	5,594	14,534	26,552
22 Jul	248	1,013	2,487	9,278	1,926	4,483	16,460	31,035
23 Jul	320	1,069	2,807	10,347	1,205	3,424	17,665	34,458
24 Jul	447	1,221	3,253	11,568	574	2,257	18,239	36,715
25 Jul	238	700	3,491	12,269	385	1,624	18,623	38,339
26 Jul	106	343	3,597	12,612	190	1,080	18,813	39,419
27 Jul	287	826	3,884	13,437	294	1,471	19,107	40,890
28 Jul	218	663	4,102	14,100	243	1,356	19,350	42,247
29 Jul	75	236	4,177	14,337	129	648	19,479	42,895
30 Jul	128	365	4,305	14,701	80	452	19,559	43,347
31 Jul	296	739	4,601	15,440	86	529	19,645	43,875
1 Aug	163	545	4,764	15,985	59	460	19,704	44,335
2 Aug	132	500	4,896	16,485	72	580	19,776	44,914
3 Aug	75	303	4,971	16,789	53	431	19,829	45,345
4 Aug	64	204	5,035	16,993	30	214	19,859	45,559
5 Aug	88	279	5,123	17,272	47	263	19,906	45,822
6 Aug	66	197	5,189	17,469	16	107	19,922	45,930
7 Aug	18	59	5,207	17,528	7	48	19,929	45,977
8 Aug	45	160	5,253	17,688	11	88	19,940	46,065

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Date	Chum				Coho			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	11	43	11	43	0	0	0	0
8 Jul	0	0	11	43	0	0	0	0
9 Jul	12	36	23	80	2	20	2	20
10 Jul	13	36	36	116	21	123	23	142
11 Jul	5	15	41	131	7	64	29	206
12 Jul	7	30	48	160	25	158	55	364
13 Jul	37	100	85	260	16	121	71	485
14 Jul	97	234	182	494	23	192	94	677
15 Jul	53	162	235	656	25	251	119	928
16 Jul	86	265	321	921	46	453	165	1,381
17 Jul	49	162	370	1,083	42	463	207	1,844
18 Jul	54	182	425	1,265	51	578	258	2,421
19 Jul	183	593	608	1,859	70	811	328	3,232
20 Jul	145	467	753	2,326	146	1,461	474	4,693
21 Jul	306	928	1,059	3,254	255	2,212	729	6,905
22 Jul	395	1,129	1,454	4,383	243	1,976	973	8,881
23 Jul	233	674	1,687	5,057	297	2,063	1,270	10,944
24 Jul	331	852	2,018	5,909	293	1,792	1,563	12,736
25 Jul	211	547	2,229	6,456	308	1,573	1,870	14,309
26 Jul	176	524	2,405	6,981	495	1,680	2,366	15,990
27 Jul	541	1,243	2,946	8,224	352	1,777	2,718	17,766
28 Jul	477	1,206	3,422	9,431	495	2,071	3,213	19,837
29 Jul	595	1,094	4,018	10,524	173	906	3,386	20,744
30 Jul	381	814	4,399	11,338	143	743	3,529	21,487
31 Jul	390	953	4,789	12,291	165	918	3,693	22,405
1 Aug	425	1,249	5,215	13,539	588	1,929	4,281	24,334
2 Aug	733	2,217	5,947	15,757	1,133	3,290	5,414	27,625
3 Aug	412	1,323	6,360	17,080	794	2,173	6,208	29,798
4 Aug	518	1,175	6,878	18,255	284	1,121	6,492	30,918
5 Aug	770	1,269	7,647	19,524	105	634	6,598	31,552
6 Aug	424	821	8,071	20,345	111	558	6,709	32,110
7 Aug	301	572	8,372	20,917	86	398	6,795	32,508
8 Aug	163	475	8,535	21,392	216	672	7,011	33,180

Appendix C2.—Estimated salmon escapement ranges along the south bank of the Yentna River, 2014.

Date	Sockeye				Pink			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	356	498	356	498	10	76	10	76
8 Jul	467	484	823	982	2	19	12	96
9 Jul	875	1,056	1,698	2,038	24	191	36	287
10 Jul	870	1,103	2,568	3,142	28	218	64	505
11 Jul	557	992	3,125	4,134	45	344	109	849
12 Jul	715	978	3,839	5,112	36	271	145	1,120
13 Jul	1,248	1,976	5,087	7,088	100	715	245	1,835
14 Jul	2,255	3,653	7,342	10,741	257	1,632	502	3,467
15 Jul	3,467	5,950	10,809	16,691	674	3,727	1,176	7,194
16 Jul	1,958	4,269	12,767	20,960	993	4,322	2,168	11,516
17 Jul	1,853	4,785	14,621	25,744	1,525	5,606	3,693	17,122
18 Jul	2,714	8,387	17,335	34,131	3,417	10,494	7,110	27,616
19 Jul	3,771	10,339	21,106	44,470	3,401	11,775	10,511	39,391
20 Jul	5,076	11,259	26,182	55,730	2,902	12,419	13,413	51,810
21 Jul	3,919	9,008	30,101	64,737	2,255	10,320	15,668	62,130
22 Jul	3,099	6,832	33,200	71,569	1,077	5,980	16,746	68,110
23 Jul	2,606	5,809	35,806	77,378	1,245	5,978	17,991	74,088
24 Jul	1,445	3,469	37,251	80,847	516	3,143	18,506	77,231
25 Jul	1,328	3,340	38,578	84,187	323	2,275	18,830	79,506
26 Jul	2,302	6,208	40,880	90,395	338	2,682	19,168	82,188
27 Jul	1,040	3,710	41,920	94,105	224	1,865	19,391	84,053
28 Jul	726	2,714	42,646	96,819	167	1,407	19,558	85,460
29 Jul	783	2,294	43,428	99,113	105	869	19,663	86,330
30 Jul	1,942	4,573	45,370	103,686	191	1,501	19,854	87,831
31 Jul	1,022	1,986	46,392	105,672	41	333	19,895	88,164
1 Aug	882	2,748	47,274	108,420	80	696	19,975	88,860
2 Aug	574	2,947	47,848	111,367	57	571	20,032	89,431
3 Aug	551	3,032	48,399	114,400	37	384	20,069	89,815
4 Aug	528	1,951	48,927	116,350	11	109	20,080	89,924
5 Aug	447	1,209	49,374	117,559	23	193	20,103	90,117
6 Aug	258	692	49,631	118,251	13	106	20,116	90,223
7 Aug	352	947	49,983	119,198	16	136	20,132	90,359
8 Aug	241	950	50,225	120,149	12	118	20,144	90,476

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Date	Chum				Coho			
	Daily		Cum		Daily		Cum	
	Min	Max	Min	Max	Min	Max	Min	Max
7 Jul	38	142	38	142	0	0	0	0
8 Jul	0	0	38	142	0	0	0	0
9 Jul	24	103	62	245	13	128	13	128
10 Jul	40	164	101	409	16	155	29	283
11 Jul	17	74	119	483	109	672	138	955
12 Jul	17	72	136	555	32	275	169	1,230
13 Jul	67	263	203	819	119	899	289	2,129
14 Jul	302	1,009	505	1,828	161	1,328	450	3,457
15 Jul	338	1,074	842	2,901	301	2,467	751	5,923
16 Jul	263	743	1,105	3,645	359	2,725	1,110	8,648
17 Jul	297	867	1,402	4,512	311	2,609	1,421	11,258
18 Jul	271	841	1,674	5,353	299	2,919	1,720	14,177
19 Jul	345	1,050	2,019	6,402	456	4,198	2,176	18,375
20 Jul	301	889	2,320	7,291	1,200	8,566	3,376	26,941
21 Jul	641	1,790	2,962	9,082	1,347	8,605	4,723	35,546
22 Jul	565	1,769	3,527	10,851	1,122	6,598	5,844	42,145
23 Jul	581	1,615	4,107	12,466	778	5,078	6,622	47,223
24 Jul	383	1,252	4,490	13,718	928	4,549	7,550	51,773
25 Jul	429	1,507	4,919	15,225	1,077	4,706	8,627	56,478
26 Jul	428	1,714	5,348	16,940	1,896	7,726	10,522	64,204
27 Jul	119	518	5,467	17,458	1,930	5,945	12,452	70,149
28 Jul	187	785	5,654	18,243	1,669	4,908	14,121	75,056
29 Jul	295	1,127	5,949	19,370	882	3,306	15,003	78,363
30 Jul	1,188	3,874	7,137	23,244	1,258	5,874	16,261	84,237
31 Jul	331	1,156	7,468	24,400	260	1,526	16,521	85,763
1 Aug	624	2,244	8,092	26,644	1,306	4,608	17,828	90,371
2 Aug	585	2,471	8,676	29,115	3,992	8,549	21,820	98,920
3 Aug	493	2,194	9,169	31,309	4,427	8,840	26,248	107,760
4 Aug	307	1,247	9,476	32,556	1,101	3,276	27,349	111,036
5 Aug	543	1,654	10,019	34,210	522	2,119	27,871	113,155
6 Aug	479	1,282	10,498	35,492	297	1,297	28,168	114,452
7 Aug	291	963	10,789	36,455	347	1,417	28,514	115,869
8 Aug	256	963	11,046	37,418	763	2,129	29,278	117,998

Appendix C3.—Yentna River north bank DIDSON estimates (total fish) by day and hour, 2014.

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Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	12	6	24	12	24	0	0	0	6	6	6	0
8 Jul	36	6	12	12	6	0	18	0	6	6	12	12
9 Jul	30	18	6	6	6	0	12	0	6	6	6	0
10 Jul	24	6	18	6	0	0	18	0	6	0	6	12
11 Jul	12	6	18	0	6	6	0	6	0	15	12	0
12 Jul	12	24	6	24	0	18	0	6	12	12	24	12
13 Jul	18	24	12	12	12	6	0	6	18	6	18	6
14 Jul	30	42	54	6	36	18	36	30	6	48	36	24
15 Jul	24	48	66	48	30	18	6	36	18	30	96	36
16 Jul	132	84	66	36	24	78	54	6	24	36	90	54
17 Jul	108	126	54	42	102	54	54	48	60	84	174	102
18 Jul	390	330	318	78	84	78	66	60	42	72	180	66
19 Jul	312	522	354	156	30	156	90	48	138	162	570	318
20 Jul	342	330	450	408	150	84	222	90	162	210	126	270
21 Jul	522	552	564	270	174	204	96	120	114	126	138	126
22 Jul	342	234	318	96	78	150	48	156	138	102	462	126
23 Jul	234	318	354	96	102	102	96	138	192	138	276	126
24 Jul	210	186	300	90	72	72	66	66	108	54	132	54
25 Jul	90	138	78	90	54	90	36	72	36	48	78	114
26 Jul	162	108	48	30	12	18	42	12	30	72	78	54
27 Jul	102	162	156	144	36	36	42	48	60	78	114	228
28 Jul	408	210	258	264	168	66	150	48	114	60	204	78
29 Jul	186	174	90	216	126	24	30	48	36	42	66	72
30 Jul	60	42	60	48	78	36	18	12	18	48	66	150
31 Jul	174	174	138	162	60	36	54	48	42	54	54	96
1 Aug	114	150	150	162	84	30	54	84	96	108	108	138
2 Aug	378	264	204	210	114	36	126	156	162	210	264	342
3 Aug	228	108	102	78	108	90	84	54	60	60	84	180
4 Aug	354	108	120	90	48	48	36	60	96	66	84	42
5 Aug	234	66	198	96	60	36	12	42	24	72	72	54
6 Aug	48	96	120	30	42	18	24	18	18	18	78	30
7 Aug	30	48	30	54	24	42	36	12	24	18	6	24
8 Aug	30	30	30	36	36	78	12	54	12	30	24	48
Total	5,388	4,740	4,776	3,108	1,986	1,728	1,638	1,584	1,884	2,097	3,744	2,994
Hr %	7.1	6.2	6.3	4.1	2.6	2.3	2.2	2.1	2.5	2.8	4.9	3.9

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Date	Estimates by hour												Daily total
	13	14	15	16	17	18	19	20	21	22	23	24	
7 Jul	6	12	6	18	24	18	18	12	24	12	12	24	282
8 Jul	6	6	12	6	12	36	12	6	6	6	6	6	246
9 Jul	18	0	12	6	6	24	6	0	6	12	6	12	204
10 Jul	0	0	0	6	24	6	18	6	12	30	6	24	228
11 Jul	24	0	12	18	6	6	12	36	18	24	18	18	273
12 Jul	24	12	18	6	12	18	0	18	12	0	18	36	324
13 Jul	6	12	0	12	30	18	6	18	24	42	12	42	360
14 Jul	30	42	18	24	12	42	54	12	18	12	18	42	690
15 Jul	54	36	102	54	24	42	54	54	36	66	54	228	1,260
16 Jul	150	78	96	102	108	54	84	96	90	60	60	156	1,818
17 Jul	144	102	138	96	60	198	126	108	96	138	90	270	2,574
18 Jul	96	126	102	252	186	72	66	240	138	126	126	348	3,642
19 Jul	258	324	204	192	270	384	348	540	288	270	114	558	6,606
20 Jul	138	162	222	222	186	180	102	420	354	300	390	354	5,874
21 Jul	474	222	474	570	132	186	390	222	300	90	66	432	6,564
22 Jul	294	342	282	540	144	174	468	192	120	114	162	372	5,454
23 Jul	240	132	300	132	198	96	174	234	162	126	162	246	4,374
24 Jul	24	228	150	72	114	210	354	300	258	162	108	132	3,522
25 Jul	216	156	120	306	180	180	102	60	18	54	60	204	2,580
26 Jul	60	126	30	48	156	114	150	114	186	96	282	168	2,196
27 Jul	72	114	300	192	108	270	198	168	132	126	60	114	3,060
28 Jul	54	150	108	72	180	144	96	90	60	54	36	30	3,102
29 Jul	30	30	36	78	78	102	42	114	18	42	18	42	1,740
30 Jul	72	108	72	30	66	108	78	78	36	30	54	36	1,404
31 Jul	60	120	90	72	60	48	120	66	18	24	18	54	1,842
1 Aug	36	96	144	138	252	174	60	144	72	114	42	54	2,604
2 Aug	66	252	126	210	234	174	276	96	150	114	48	30	4,242
3 Aug	198	126	216	174	60	198	114	108	102	48	60	84	2,724
4 Aug	36	54	60	60	84	66	90	54	30	0	12	42	1,740
5 Aug	60	24	42	54	72	102	30	48	42	66	90	12	1,608
6 Aug	24	66	48	42	30	96	54	24	18	78	30	42	1,092
7 Aug	30	30	42	48	24	36	30	18	30	24	24	42	726
8 Aug	24	48	48	6	30	108	72	6	24	12	36	60	894
Total	3,024	3,336	3,630	3,858	3,162	3,684	3,804	3,702	2,898	2,472	2,298	4,314	75,849
Hr %	4.0	4.4	4.8	5.1	4.2	4.9	5.0	4.9	3.8	3.3	3.0	5.7	1.000
95% Confidence interval													75,831–75,867

Appendix C4.—Yentna River south bank DIDSON estimates (total fish) by day and hour, 2014.

Date	Estimates by hour											
	1	2	3	4	5	6	7	8	9	10	11	12
7 Jul	12	18	6	0	0	12	6	12	0	18	12	18
8 Jul	12	24	18	30	0	18	0	12	18	36	36	24
9 Jul	36	18	54	30	12	42	36	54	12	84	66	36
10 Jul	90	42	60	42	36	24	36	24	66	132	60	84
11 Jul	42	84	66	60	48	48	42	54	72	126	84	60
12 Jul	78	24	30	6	54	36	36	90	12	30	108	48
13 Jul	42	36	42	18	48	96	48	30	48	96	72	48
14 Jul	270	162	144	108	84	120	144	204	168	222	210	234
15 Jul	342	336	450	342	222	312	294	192	312	276	312	372
16 Jul	270	408	414	372	246	348	240	222	270	114	378	222
17 Jul	228	270	264	234	288	246	234	264	162	198	642	270
18 Jul	750	696	630	492	486	618	282	564	306	954	948	342
19 Jul	768	546	540	480	546	480	300	222	342	450	426	714
20 Jul	954	1,050	894	504	318	390	594	648	548	906	354	468
21 Jul	816	1,020	798	612	390	510	402	300	732	306	1,212	696
22 Jul	678	384	588	462	390	306	114	402	288	696	1,248	114
23 Jul	420	498	450	312	366	396	258	312	318	564	714	504
24 Jul	252	474	288	198	150	198	258	204	212	246	174	264
25 Jul	312	264	258	252	126	132	126	126	126	120	378	564
26 Jul	312	414	264	300	432	318	258	374	204	408	540	498
27 Jul	396	324	462	348	306	126	102	156	150	120	210	702
28 Jul	396	354	390	312	312	234	180	348	210	348	330	252
29 Jul	216	306	360	294	228	126	150	150	168	186	108	306
30 Jul	462	378	498	480	432	216	258	294	582	342	276	606
31 Jul	132	114	156	114	126	72	72	78	78	42	78	156
1 Aug	132	234	294	330	174	252	192	192	312	342	150	222
2 Aug	480	414	480	438	456	192	252	324	594	318	270	678
3 Aug	408	324	552	438	402	348	378	474	588	492	492	450
4 Aug	366	210	168	264	228	78	48	138	90	288	78	162
5 Aug	108	336	270	168	156	84	54	60	96	42	96	198
6 Aug	120	150	114	108	96	78	60	78	90	48	60	108
7 Aug	174	60	102	60	90	54	42	30	66	54	132	114
8 Aug	114	156	180	66	120	36	48	72	60	120	66	114
Total	10,188	10,128	10,284	8,274	7,368	6,546	5,544	6,704	7,300	8,724	10,320	9,648
Hr%	4.5	4.5	4.6	3.7	3.3	2.9	2.5	3.0	3.3	3.9	4.6	4.3

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Date	Estimates by hour											Daily total	
	13	14	15	16	17	18	19	20	21	22	23	24	
7 Jul	6	18	42	108	60	42	30	30	30	30	24	12	546
8 Jul	12	6	18	18	12	18	18	48	6	24	36	42	486
9 Jul	66	18	48	96	60	42	42	42	54	48	72	78	1,146
10 Jul	78	60	60	102	12	36	42	18	18	18	54	30	1,224
11 Jul	48	42	30	60	42	42	54	48	108	30	30	42	1,362
12 Jul	42	54	24	60	60	84	30	72	36	42	48	30	1,134
13 Jul	150	120	174	132	126	144	96	210	216	222	168	150	2,532
14 Jul	72	336	174	246	114	390	210	258	186	114	330	300	4,800
15 Jul	156	390	534	306	180	426	456	576	336	378	342	276	8,118
16 Jul	198	318	522	396	294	414	294	276	264	192	168	252	7,092
17 Jul	444	324	540	318	330	498	444	174	210	432	516	684	8,214
18 Jul	432	402	678	516	354	552	480	1,050	528	390	618	834	13,902
19 Jul	390	948	846	870	738	1,164	1,002	468	786	840	1,302	1,386	16,554
20 Jul	1,008	1,266	1,014	630	948	894	1,212	1,242	864	882	1,002	972	19,562
21 Jul	672	1,110	1,236	582	480	1,152	714	1,104	570	612	492	798	17,316
22 Jul	366	618	678	786	360	786	540	288	450	612	642	654	12,450
23 Jul	528	336	270	792	210	564	396	690	438	300	618	474	10,728
24 Jul	204	300	432	534	348	600	270	312	516	330	186	402	7,352
25 Jul	480	348	624	366	702	342	282	60	198	228	264	438	7,116
26 Jul	504	597	732	719	846	1,080	444	480	294	510	324	318	11,170
27 Jul	324	390	432	126	516	312	486	318	354	228	306	264	7,458
28 Jul	216	90	198	224	408	240	198	312	174	228	60	72	6,086
29 Jul	276	168	168	234	156	258	138	192	96	72	150	120	4,626
30 Jul	222	300	312	732	552	876	330	354	312	342	330	240	9,726
31 Jul	240	90	204	192	210	120	234	246	138	108	78	90	3,168
1 Aug	300	438	378	486	462	186	162	306	102	138	216	354	6,354
2 Aug	222	312	336	786	576	702	348	348	336	384	312	222	9,780
3 Aug	312	672	600	402	390	576	492	306	282	168	138	246	9,930
4 Aug	180	222	150	282	162	108	150	210	90	156	102	246	4,176
5 Aug	114	198	96	192	126	192	198	102	120	102	102	42	3,252
6 Aug	48	120	60	120	72	102	78	66	108	42	126	84	2,136
7 Aug	48	78	54	108	96	114	108	150	138	42	150	96	2,160
8 Aug	102	108	36	168	198	114	156	156	108	126	102	138	2,664
Total	8,460	10,797	11,700	11,689	10,200	13,170	10,134	10,512	8,466	8,370	9,408	10,386	224,320
Hr%	3.8	4.8	5.2	5.2	4.5	5.9	4.5	4.7	3.8	3.7	4.2	4.6	100.0
95% Confidence interval													224,278–224,362

Appendix C5.—Daily sockeye escapement estimates for the Yentna River using drift gillnet (GN), fish wheel (FW), GN and FW averages and GN, FW catch per unit effort (CPUE) combined, 2014.

Date	North bank				South bank			
	GN	FW	Average	CPUE	GN	FW	Average	CPUE
7 Jul	282	212	247	257	546	406	476	455
8 Jul	221	203	212	217	486	467	476	478
9 Jul	153	95	124	136	1,146	887	1,016	964
10 Jul	182	44	113	131	1,020	905	963	961
11 Jul	234	57	146	160	908	789	848	820
12 Jul	324	192	258	253	756	772	764	769
13 Jul	270	125	197	218	1,969	1,487	1,728	1,621
14 Jul	345	134	240	214	3,055	2,448	2,751	2,628
15 Jul	441	121	281	268	6,615	3,467	5,041	5,108
16 Jul	788	66	427	423	3,103	1,958	2,530	2,400
17 Jul	1,164	93	629	609	3,791	1,853	2,822	2,735
18 Jul	1,029	94	562	500	4,990	2,714	3,852	3,845
19 Jul	2,368	284	1,326	1,211	2,508	3,771	3,140	3,288
20 Jul	1,659	284	971	993	8,892	5,076	6,984	6,595
21 Jul	1,387	327	857	906	7,326	4,344	5,835	6,160
22 Jul	1,581	248	915	1,072	2,306	3,996	3,151	3,036
23 Jul	1,266	320	793	945	2,490	2,939	2,715	2,694
24 Jul	961	506	733	795	1,498	2,226	1,862	1,778
25 Jul	645	311	478	548	2,053	2,396	2,224	2,166
26 Jul	425	205	315	369	3,964	4,539	4,251	4,237
27 Jul	322	435	378	357	1,776	2,438	2,107	1,974
28 Jul	587	390	488	527	1,014	1,788	1,401	1,300
29 Jul	360	125	243	315	1,060	1,708	1,384	1,199
30 Jul	134	218	176	178	2,210	3,786	2,998	2,801
31 Jul	561	479	520	523	1,056	1,711	1,383	1,353
1 Aug	710	408	559	595	1,030	2,133	1,581	1,477
2 Aug	461	371	416	438	889	1,916	1,402	1,260
3 Aug	0	215	108	57	1,135	1,921	1,528	1,514
4 Aug	316	153	234	264	363	1,479	921	827
5 Aug	230	166	198	192	610	1,036	823	789
6 Aug	0	137	68	61	305	583	444	424
7 Aug	97	42	69	74	810	801	805	804
8 Aug	0	125	62	95	484	705	595	576
Totals	19,503	7,183	13,343	13,902	72,164	69,443	70,803	69,035

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Date	Both banks			
	GN	FW	Average	CPUE
7 Jul	828	618	723	711
8 Jul	707	669	688	695
9 Jul	1,299	982	1,140	1,100
10 Jul	1,202	949	1,076	1,092
11 Jul	1,142	846	994	980
12 Jul	1,080	964	1,022	1,022
13 Jul	2,239	1,612	1,926	1,839
14 Jul	3,400	2,582	2,991	2,841
15 Jul	7,056	3,587	5,322	5,376
16 Jul	3,891	2,024	2,957	2,823
17 Jul	4,956	1,946	3,451	3,344
18 Jul	6,020	2,808	4,414	4,345
19 Jul	4,876	4,055	4,466	4,499
20 Jul	10,550	5,360	7,955	7,588
21 Jul	8,713	4,670	6,692	7,066
22 Jul	3,886	4,244	4,065	4,108
23 Jul	3,757	3,259	3,508	3,638
24 Jul	2,458	2,732	2,595	2,573
25 Jul	2,698	2,708	2,703	2,714
26 Jul	4,389	4,744	4,566	4,605
27 Jul	2,098	2,873	2,485	2,331
28 Jul	1,601	2,178	1,889	1,827
29 Jul	1,420	1,833	1,626	1,514
30 Jul	2,344	4,004	3,174	2,980
31 Jul	1,617	2,190	1,903	1,876
1 Aug	1,741	2,541	2,141	2,072
2 Aug	1,350	2,287	1,818	1,699
3 Aug	1,135	2,136	1,636	1,571
4 Aug	679	1,632	1,156	1,091
5 Aug	839	1,202	1,021	981
6 Aug	305	719	512	485
7 Aug	907	842	875	878
8 Aug	484	830	657	672
Totals	91,667	76,626	84,146	82,937
95% CI	84,547–98,786	74,378–78,873		81,678–84,195
2012 Totals	99,400	35,400	67,400	62,600
2013 Totals	286,928	76,227	181,577	166,929

Note: Combined FW and GN catches were given equal weight by adjusting sampling effort to 24 hours.